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ILLUSTRATED FEATURES *Hermann Krusi, C. E. (frontispiece in color)—Ceylon Rubber Exhibition—Kiangnan Dock Works—British North Borneo Trading Company, etc.*

VOL. III: No. 9. MANILA, SHANGHAI AND YOKOHAMA, FEBRUARY, 1907

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# THE FAR-EASTERN REVIEW




## ENGINEERING, COMMERCE, FINANCE.

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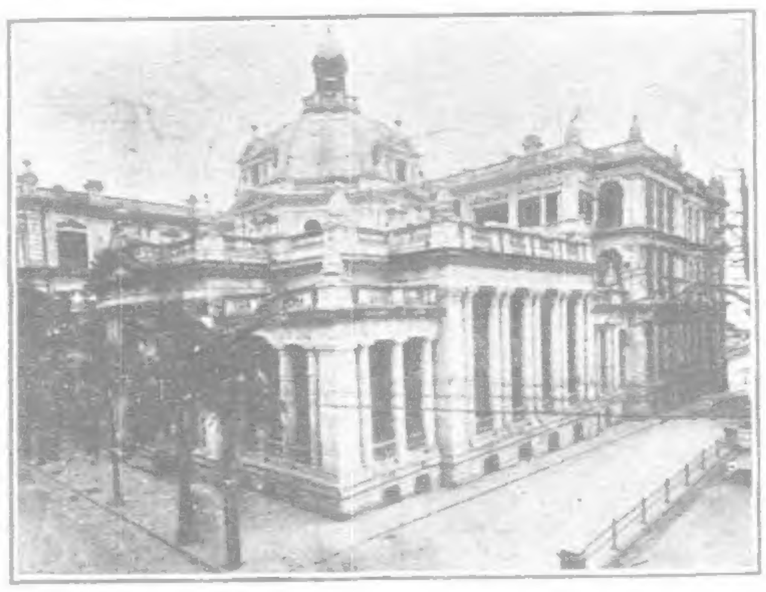
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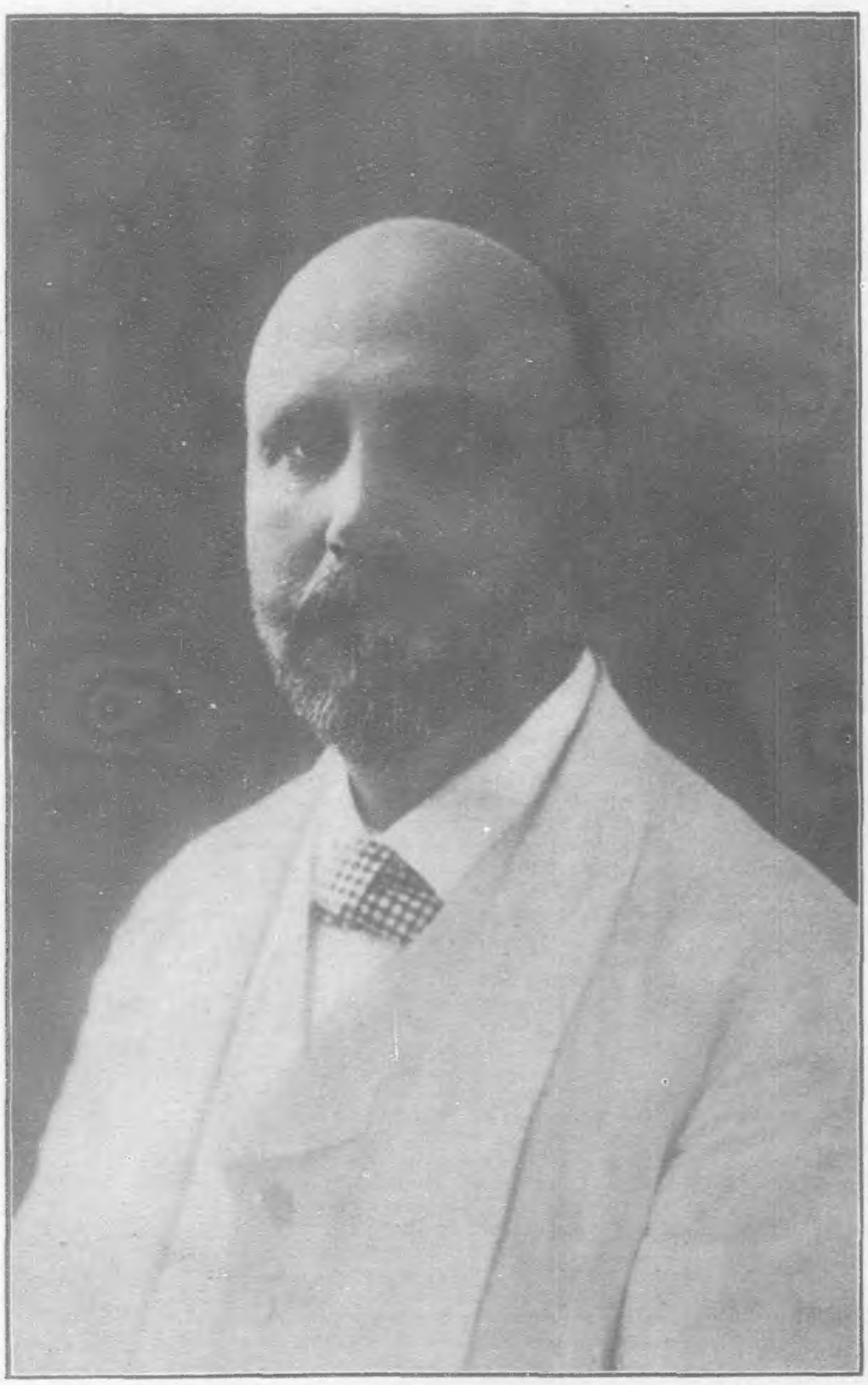
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# THE FAR EASTERN REVIEW

COMMERCE • ENGINEERING • FINANCE

VOL. III. MANILA, P. I., SHANGHAI, AND YOKOHAMA, FEBRUARY, 1907. No. 9.

(See page 288)

## HERMANN KRUSI, C. E.

**First Vice-President of the Atlantic, Gulf and Pacific Company, the Largest Hydraulic Dredging Concern in the World, and General Manager of Its Oriental Branch at Manila, Philippine Islands**

# THE FAR EASTERN REVIEW

GEO. BRONSON REA, M. E.

PUBLISHER AND EDITOR

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## MR. KOCH'S SECOND PAPER.

Owing to the late date on which Mr. Koch's second paper on reinforced concrete was received in this office, we regret our inability to publish it this month. It is a very instructive treatise on the practical design of arches, with notes on construction, and will appear in the March number of THE REVIEW.

## VISAYAN RAILWAY CONTROVERSY

In another part of this issue we publish a digest of the report of Mr. F. A. Molitor, Supervising Railway Expert of the Philippine Government, in which he stated to the Governor-General his reasons for recommending disapproval by the latter official of the definite plans of location of 40 miles of railway in the islands of Cebú and Panay, submitted by the Chief Engineer of the contractors for the Philippine Railway Company. Mr. Molitor took the stand that in the submission of incomplete plans, specifications and profiles, the Chief Engineer had not complied with the requirements of the law, and he expressed the belief that Mr. Beard's estimate of the cost of construction ($47,473.03 gold per mile) was excessive. For these and other minor reasons he asked the Governor-General to disapprove.

With reference to the particular surveys under consideration, the Supervising Railway Expert affirmed that he had no fault to find with them in the main, and when the Chief Engineer for the contractors insisted that it was impossible for him at that time to submit complete plans and specifications of the entire construction, and that the delay caused by holding up the roadbed construction on that account would work a great hardship on the contractors, the Governor-General deemed it wise to approve the surveys and let the roadbed construction proceed. In approving of the surveys he made it clear that he was not approving of the estimated cost of construction per mile, handed in by the Chief Engineer, holding that the cost of the work was a matter that could be determined after its completion and the rendition of accounts by the contractors for Government audit. Mr. Molitor told the Governor-General that he thought the financial outlay should be restricted to $35,000 gold per mile, but the executive said that as matters stood he was not inclined to consider the question of cost.

Thus it came about that upon approving of the 40 miles of surveys submitted, the Governor-General organized a special auditing department to handle railway accounts. This department will pass upon the cost of surveys, labor, materials, construction, administration, inspection, and all other details of the railways to the smallest item, and if the elaborate system of audits is adopted by the Governor-General that has been submitted to him for approval we verily believe the intricacies of it will keep the administration of the railway people working overtime. The auditing department will be under the supervision of Mr. Kendall, Railroad Engineer in the Bureau of Public Works, who has been transferred to the Bureau of Audits of the Government for temporary duty in this connection.

On the whole we doubt very much whether railroad construction in the Visayan Group will prove as satisfactory to the contractors as it might have been had this first controversy never occurred. That the Governor-General's attitude throughout has been prompted by the sincerest of motives and an ardent desire to see the Visayan railroad construction pushed to completion with the least possible delay, has been clearly demonstrated by his impatience in getting the contractors started on this first 40 miles of line. Indications are that he has carefuly safeguarded the Government's interests at the same time, although, from the standpoint of Mr. Molitor, it seems clear that the requirements of the law under which this construction is to be carried on have in several instances been ignored. Yet, as the Governor-General is a lawyer of no mean ability, no doubt he is the best person to determine whether or not his position is right.

Probably the most regrettable feature of this controversy is the resignation of Mr. Molitor. The record shows that he and the Governor-General were at cross-purposes almost from the beginning, and this being the case Mr. Molitor concluded that his services could be of no further value to the Government. It appears that the Governor-General was slow to act upon Mr. Molitor's resignation, which he only accepted after telegraphic consultation with the Secretary of War.

Large quantities of construction material are now on the ground at Iloilo and Cebu and the construction of the 20 miles of line from the City of Cebu to Argao and the 20 miles from Iloilo to Pototan, for which the surveys have been approved, is progressing as satisfactorily as labor and other local conditions will guarantee.

## RUBBER INDUSTRY OF THE EAST

The rubber industry shows unparalleled activity in the East at the present time. A noteworthy indication of its increasing importance in this part of the world was the recent successful rubber exhibition in Ceylon. The tea growers of that island discovered several years ago that this industry was proving far more profitable than their own, so some began to convert their plantations into rubber areas. Experiments also demonstrated the fact that the uplands of the island would produce certain species of rubber and bring immense returns, and they immediately began to extend the rubber-growing districts in that direction. Today Ceylon is a veritable forest of fine rubber trees.

When the results obtained in Ceylon became known the landholding interests in the Federated Malay States, in the Dutch East Indies, and in Borneo, turned their attention to the promotion of the industry in their respective localities. So successful has rubber-growing proven in these districts that in many localities in the Federated Malay States what had been dividend-earning tin-mining properties are being converted into rubber-growing enterprises with a confidence in better returns that shows wisdom. Today these properties are valuable rubber plantations. Numerous companies for the extension of the industry have been organized and more are being formed. The Mecca of much British capital is the Federated Malay States, and capitalists are sparing neither money nor physical effort to secure their place in the field. The soil of Malaya seems to be peculiarly adapted to rubber culture and indications are that before long this country will lead the industry in the East.

Experiments in rubber culture have demonstrated that certain parts of the Philippine Islands are well adapted to the industry, particularly the islands of the Moro Province which includes the great Island of Mindanao where rubber seems to flourish with particular avidity. Planters down there have taken up the industry with great enthusiasm. While it is yet in its extreme infancy there is very indication that the time is not far distant when rubber-growing will become a most important business with them. The Director of the Bureau of Forestry is an enthusiast over the possibilities for rubber in the southern islands and he promises that his bureau will do everything in its power to assist the planters in establishing rubber plantations. He announces that his bureau is ready to coöperate with these planters by way of giving advice and detailed information regarding the planting and growing of rubber, assisting them in securing seeds, and in a general way acting as their agent in Manila, as it were, to help them along. The foresters of the Government will be placed at the disposal of the planters whenever such assistance is requested, and the Bureau of Forestry will gladly make any legitimate demand upon it in this line its special business to the limit of its resources and experience. This seems to be a most liberal and praiseworthy proposition on the part of Major Ahern and we believe that when the intentions of the bureau become better known among the planters they will gladly take advantage of the offer.

## RAILWAY CONSTRUCTION IN CHINA

During the last year the Chinese have taken a decided stand against foreign help in the construction of their railway. They have tabooed

the foreign engineer and the foreign capitalist. China for the Chinese and Chinese railways for the Chinese investor and engineer, have been so persistently advocated everywhere throughout the progressive communities of the Empire that, regardless of consequences, the foreigner and his money and genius are boycotted. We will not say that the principle involved is not a sane and a preservative principle, everything else being equal, but we have serious doubts of the ability of the Chinese to handle their own railway schemes successfully at this time. That gridironing their Empire with railways is the first wise step towards the development of its inestimable hidden wealth, must be conceded. Yet, by the announced anti-foreign policy in respect to this development we already see signs of enormous financial losses for the gentry through *graft* by the official clique, to say nothing of the greater losses that will result from bad engineering and worse construction which must of a certainty result from the inexperience of the Chinese in railway building.

The natives have innumerable railway schemes under way at present. The promoters are securing valuable rights from the Government, together with the material support of the latter for their schemes, and they are going broadcast among the gentry with their anti-foreign slogan and raising the funds for the construction of the lines. They are raising millions of dollars of capital among the masses, most of which will later on be squandered for lack of experience and to gratify the selfish ends of unscrupulous and crafty manipulators of the financial end of these companies. For the sake of the country's future, and in the interest of the people, we would like to see something encouraging in the situation as it presents itself today, but we can not. The present outlook portends nothing but ruin for the future of this engineering development.

The organization of one native railroad company reflects the organization of them all where the foreign influence is excluded. The promoters are generally the higher official class in combination with the wealthier and shrewder of the gentry. They go forth with the ever-popular anti-foreign campaign and arouse the gentry to a pitch where, before they think what they have done, they pour their gold into the treasury of the company, not realizing that this money has been donated to some unstable railroad project, but inflated with the idea that they are going to stamp out the foreign devil and exterminate his evil influence. When the company gets the control of the money there immediately begins a battle royal among the crafty promoters for its possession. What becomes of it then, or the greater part of it at least, is the same old story. Under the pretext of pushing surveys and the construction of lines, incompetent engineers are sent into the field to make a showing and this is sufficient to satisfy the gentry for the time being. In spite of the numerous all-Chinese railway projects which have had birth during the last two years we are unable to recall a single one that has not become embroiled over finances. It is true that some money has been expended to keep up the courage of the gentry investors, but further than the preliminary surveys few of the companies have gone. These surveys have proven to be most expensive and unsatisfactory, and for the most part what construction work has been done by the Chinese has been uncertain in stability and far distant from good, economical engineering practice.

It is not our desire to rail against the Chinese because they have barred the foreigner with his capital and his engineers from their railway enterprises, but we do believe that they are making a grave mistake in the policy they have adopted. With foreign capital judiciously negotiated and restricted and with the help and advice of foreign engineers of experience the situation may yet be saved; without these, however. Most of the foreign-built railroads in China are substantial lines, well-managed and safely conducted both for the people and the financial interests involved. Under foreign supervision the reckless expenditure of funds has been kept down to the minimum because the work of the engineer has been along those conservative lines which only large experience in railway construction and equipment can guarantee. We believe the time will come when the Chinese may be able economically to carry on their own railway construction, but that time is just now part of the dim and distant future. Unselfish administrative ability and competent engineering practice must first be drilled into the Chinese ere this condition can be hoped for.

And there is no objection to the Chinese raising money for the railroads and holding a majority or all of the stock in their own companies, but they must look to the foreigners for the administrative and engineering conduct of their projects if they ever hope to succeed in their important undertakings. Whether these foreigners be British, Belgian, French, German, American, or of any other nationality, is a matter of a little importance, but they are the only recourse for the Chinese to save the situation.

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## PHILIPPINE MINING AND MINERALS

In that section of his fifth annual report, just issued, which deals with the operations of the Division of Mines during the period under review, the Director of the Philippine Bureau of Science discusses the coal and other mineral resources of the Islands, which, he believes, are now on a fair way towards profitable development by the miner. For several months past the Division of Mines has been in a more or less disorganized state owing to the absence and final resignation of the Chief of the Division, Mr. H. D. McCaskey, and the lack of a sufficient number of operators to carry on the field work. A reorganization of the division is now being effected, which will include the employment of a larger operating staff, with a view to increasing the scope and volume of its work. This announcement will meet with the approval of the mining community and ought to give a pronounced impetus to the industry in general.

So far as is known at present, coal areas exist in Luzon, Batan, Polillo, Mindoro, Masbate, Negros, Cebú, Samar, Leyte, and Mindanao, and they promise to fill local needs in the future. The present wholesale price of Australian coal, laid down in Manila, is about ₱12.65, and the retail price about ₱16.50, these figures per ton of 2,000 lbs. Japanese coal is scarce on the local market owing to shortage in the stocks at home, but when the supply here is active the prices per ton of 2,000 lbs. are about the same as those which prevail for the Australian product. The lack of a cheap and good quality of coal is one of the greatest commercial obstacles we have to encounter in the Philippines, and, therefore, it has been the endeavor of the Division of Mines to push the study of the coal deposits as rapidly as its limited field staff could guarantee. A thorough study of the coalfields with a view to the most economic utilization of the grades of lignite and bituminous coal, and to their commercial importance is being carried on. Together with the promising deposits in Cebú, petroleum is known to exist near the town of Toledo, in that island, and in Tayabas Province. Since the insurrection, only limited explorations along this line have been made, but it is proposed to take up this question of mineral oil for careful and thorough investigation at a very early date. The analyses of the Compostela coal in Cebú have shown satisfactory gas-producing power.

The Division of Mines has succeeded in bringing out much important information regarding the mining operations for ore-bearing minerals in the Benguet country, and in the Mancayan-Suyoc region, while the mining field in Masbate has not been neglected. There are many other problems which have been undertaken but which have advanced slowly, owing to lack of numbers in the division. These questions include the investigation of limestones for economic purposes; of clays, building-stone deposits, rocks suitable for cement making, and of other materials which would be of value for structural purposes in the Philippine Islands; the investigation of the placer-mining industry and dredger ground in the provinces of Pampanga, Nueva Ecija, and Rizal; the placer mining fields of Pigtao and Misamis, Mindanao; the mineral resources of the Agusan River region in Surigao and Placer, Mindanao; the exploratory reconnoissance of the mineral resources of the Cagayan River Valley, etc. It is the intention of the division to push these explorations with much vigor in the near future. The Bureau of Science will hereafter publish all of its geological maps in a canvas-backed edition, in a form which will enable them conveniently to be handled. These will be placed on sale, together with a series of pamphlets covering matters of interest to the miners.

The asbestos deposits lying in Ilocos Norte along the flanks of the central mountain chain of Luzon and extending almost due north and south for a distance of about 30 miles, constitute a mineral deposit of much importance, and these deposits will soon receive their share of the division's attention. This occurrence was known to the Spaniards before American occupation. The asbestos is probably, in part, of the chrysotile variety; it occurs in veins in serpentine and in less completely altered peridotites, the veins being from 2 to 10″ wide. The fiber is part silky and is from 1 to 8″ long. Magnesite is also present in considerable quantities. This source of asbestos is sufficiently close to the sea to insure a fairly small outlay for transportation to points where coastwise steamers call, and labor, timber, and water are reported to be reasonably cheap. The economic geology of Ilocos Norte constitutes another important feature for future work which in time will need to be developed.

A series of studies on the volcanoes of the Islands is under way. As opportunity occurs the division will continue to gather material in this branch of geologic investigation until it is complete. An interesting description of the volcanoes might readily be prepared at the present time, but in respect to completeness this would be of little value. For example, the region covered by Taal Volcano, Island of Luzon, probably extends from the seashore at Batangas to Laguna de Bay. This area is a very large one and therefore any understanding of the life history of the volcano would involve a study of great magnitude, as an examination of the present crater readily reveals the fact that it is only an incident in the whole.

The important question of an adequate space for the mining division at the laboratories of the Bureau of Science and the fundamental importance of a place systematically to group and to begin the collection of specimens typifying the mineral resources of the Islands and the geologic and paleontologic material which is accumulating in the Division of Mines is one which the Philippine Commission should give immediate attention to. The initial cost of a wing to the building, the Director points out, would not be very great, and from a business standpoint it is believed that the loss due to inadequate quarters for the division and the inability properly to expand to meet future needs will far outweigh the interest and deterioration on a reasonable investment.

In commending the work done by the small staff of the Division of Mines during the last year, we believe especial praise is due to Mr. Warren D. Smith for his untiring and unremitting geological investigations. He has accomplished a wonderful amount of most valuable surveys and all of his reports on the results of his explorations have been of supreme merit. A. J. Eveland, M. E., also deserves mention for his valuable services to the Government, and it is a matter of keen regret on the part of the mining community that he has left the public service. Mr. Maurice Goodman, another geologist who has worked with Mr. Smith on many of the largest and most important surveys, is also a painstaking and thorough member of the field staff of the Division of Mines, and with a few more such men, under the direction of a competent and aggressive chief of division, the mining industry of the Islands and their mineral resources should develop with a rapidity that would bring probably immediate commercial returns.

# REPORT ON THE RUBBER EXHIBITION AT PERADENIYA, CEYLON

*[Wallace I. Hutchinson, M. F., the Government Forester stationed at Zamboanga, Moro Province, attended the recent Ceylon Rubber Exhibition, held at Peradeniya, as delegate of the Philippine Bureau of Forestry, and has just made an interesting and instructive report covering the same to Major George P. Ahern, U. S. Army (retired), Director of the bureau. Mr. Hutchinson's observations cover quite thoroughly practically all phases of the rubber industry in the East represented at the exhibition. The wonderful strides this industry is making in this part of the world at the present time should command for the results of Mr. Hutchinson's visit to Ceylon general interest. We are indebted to Major Ahern for the use of photographs from which our illustrations are taken. They are part of a set which carried off First Prize at the exhibition.*—EDITOR'S NOTE.]



GENERAL VIEW OF THE RUBBER EXHIBITION BUILDINGS AT PERADENIYA, CEYLON

The Rubber Exhibition which was held at Peradeniya, Ceylon, September 13 to 27, 1906, was unique, not only in the annals of the Colony, but in the history of the rubber industry itself. It is a remarkable thing that within a few years of the commencement of the industry of rubber planting a special exhibition should be held, under Government auspices, for this planting product alone. The high importance of this industry, not only in its future value to the Orient, but in its immediate and future bearing on manufacturing enterprises, carried on in all countries and essential to civilized man at the present day, difficult to estimate. The Rubber Exhibition provided not only the best, but the first means by which the progress of the plantation rubber industry could be measured.

The exhibition was on a wide scale and of a representative character. That this was the prime object of its promoters is clearly shown in the circular letter sent to all parts of the world, which reads as follows:—

"It is hoped that the exhibition—the first of its kind ever held—will afford an opportunity for planters and manufacturers of rubber in all parts of the world to meet at Peradeniya for discussion, as well as for study, of the machinery and rubber exhibits to be collected here."

Ceylon naturally occupied the premier place in the number of exhibits, but the Malay Peninsula and India both sent representative collections of their rubber products.

Among the foreign exhibits deserving special mention was the fine collection of rubber samples from the various tropical countries, sent to Ceylon by Messrs. Figgis & Co., of London, and the map illustrating the centers of rubber production of the world by Mons. Van der Kerckhoven.

The Philippine exhibit, which was distinctly different from any other shown, attracted considerable attention and favorable comment.

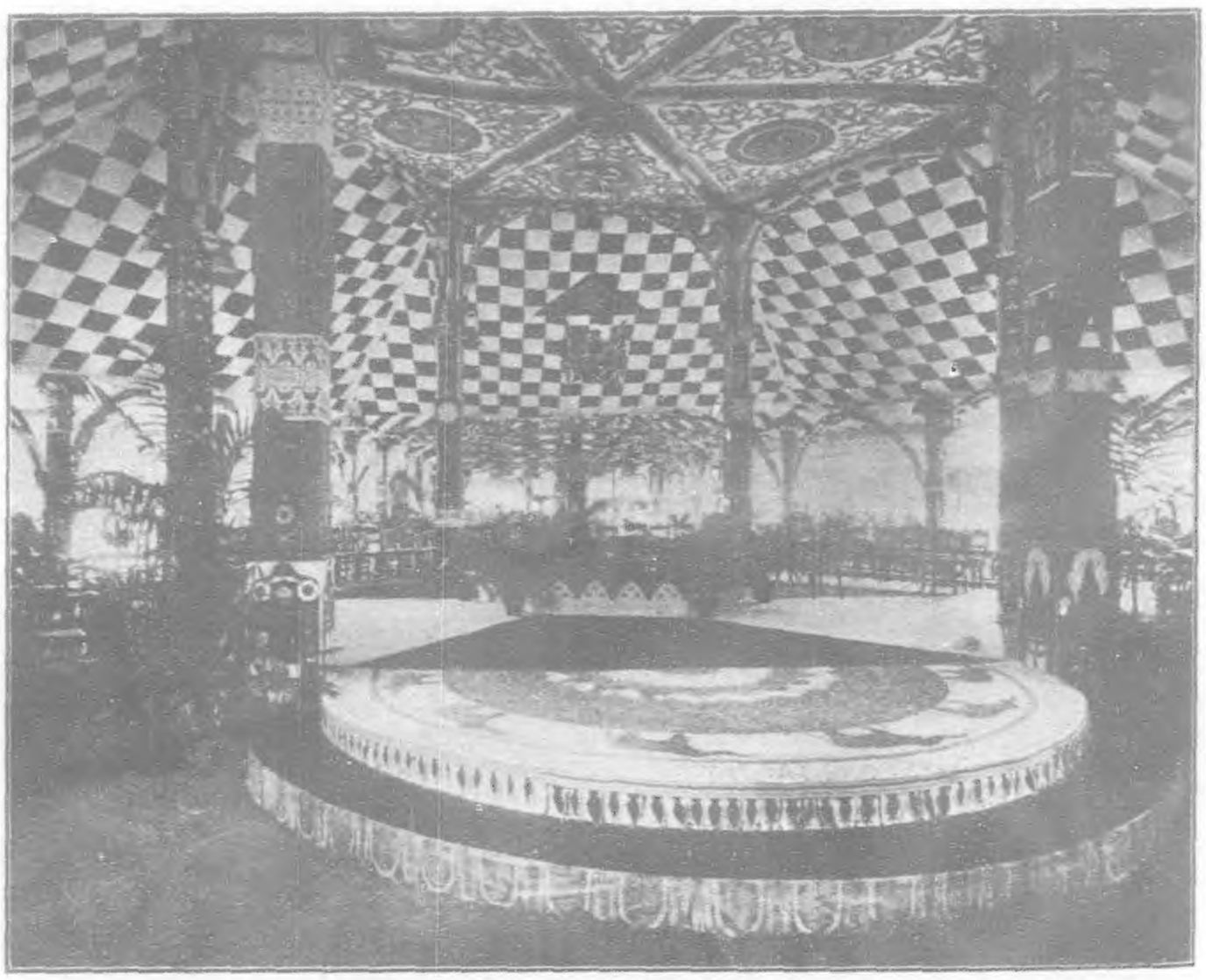
The exhibition was not only a benefit to planters, in that it worked out for them the science of rubber cultivation, but it also undoubtedly did much to encourage the industry throughout the countries in the Orient where the soil and climatic conditions are suitable for rubber growing.

Planters of the Colony and representatives from the various countries present at the exhibition, after viewing the tools and machinery invented for the extraction and preparation of rubber, could not but come to the inevitable conclusion that the old and crude methods of supplying the demands of the rubber market are doomed to failure when placed in competition with the new industry, systematically and scientifically conducted.

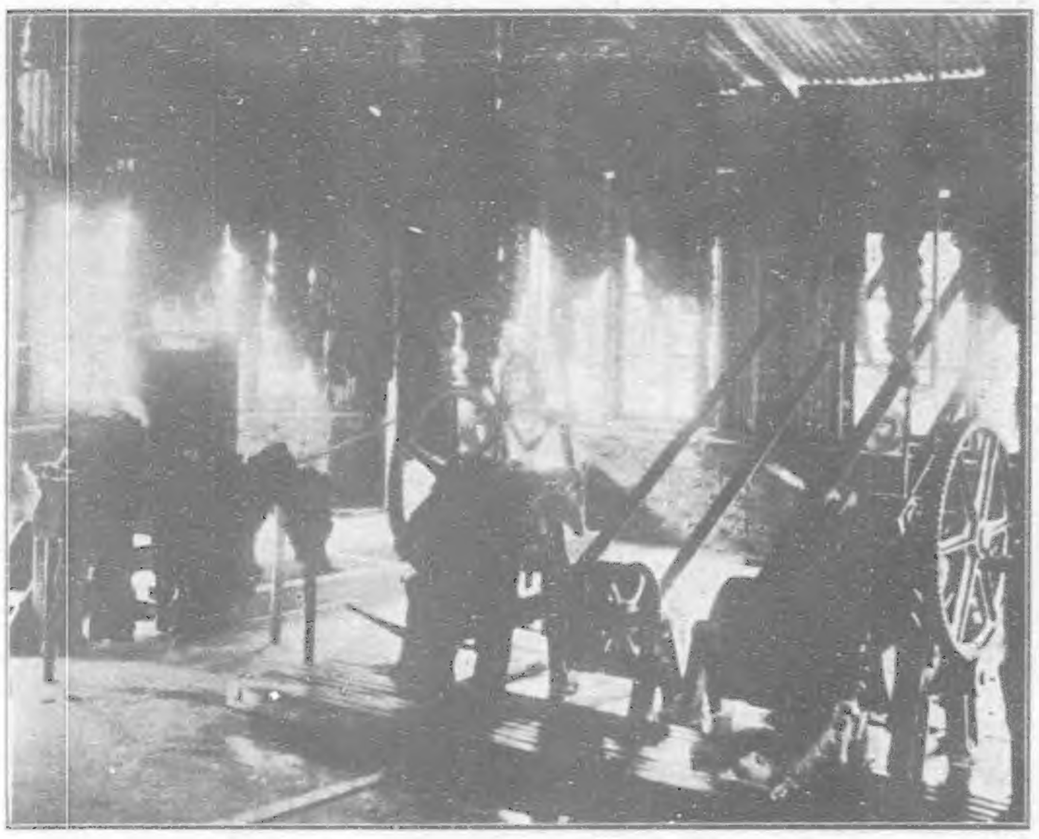
The meteoric rise of the rubber industry forms one of the remarkable chapters in the history of tropical agriculture. Twenty years ago rubber from *East of Suez* was an almost unknown commodity. Today thousands of tons are shipped annually from Ceylon, India and the Malay Peninsula to meet the demands for the product which has become a prime necessity of modern civilization. A few years ago it was found that the native rubber gatherers, who worked erratically and by the crudest methods in the great forest covered region draining the Amazon, could no longer supply the increasing demand for raw rubber. The solution of the problem, however, has been found in the systematic cultivation of rubber, and the building up of the industry in the healthier, more accessible parts of the East is undoubtedly an achievement worthy of note.

BUILDINGS AND EXHIBITS.—The site of the exhibition was the most central and appropriate that could be selected in Ceylon. The buildings were erected on the lawns in the center of the Royal Botanic Gardens at Peradeniya, surrounded by luxuriant tropical vegetation. The central exhibition building consisted of a main hexagon, with three wings which held the rubber exhibits, while numerous detached buildings, tents and *marquees* were used for machinery, exhibits of Kandayan arts and crafts, refreshment booths, etc. The interior of the main building was decorated with bunting, the pillars being hand-painted by Kandayan artists. The hexagon, in the center of which a fountain played, was used as a lecture-room, and it was here also that the opening ceremonies were held and the presentation of medals and awards made.

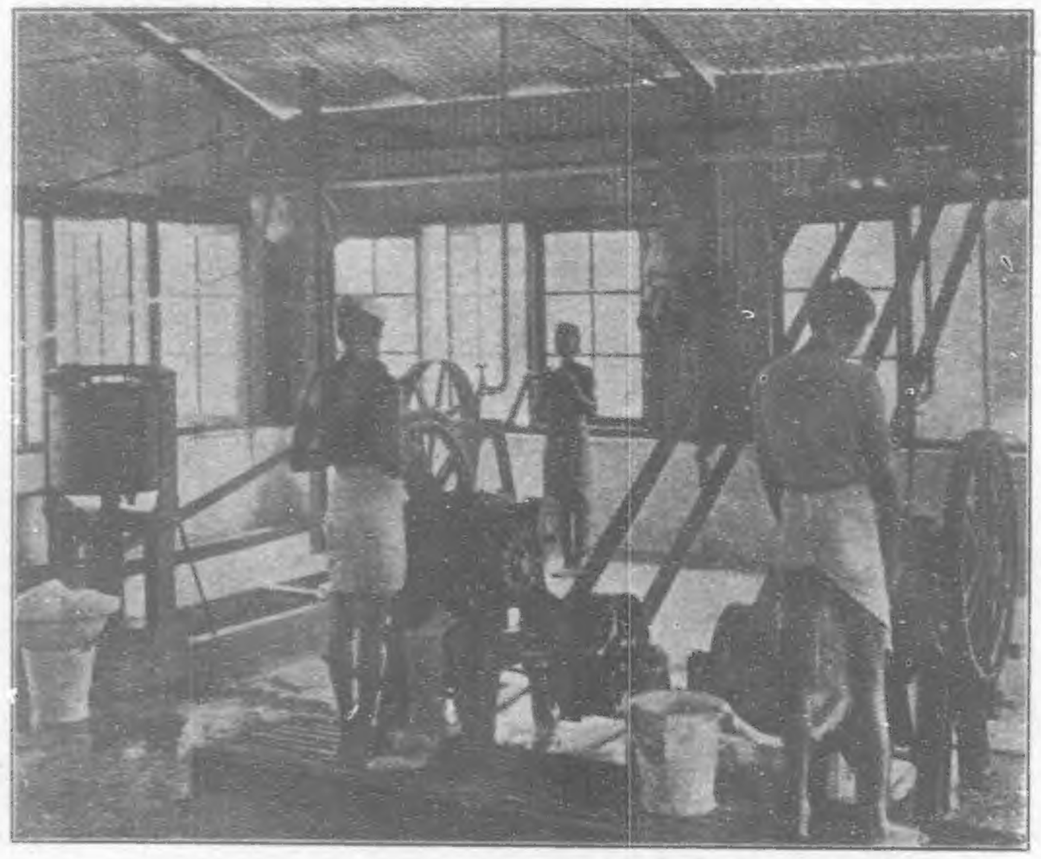
The Malay States and Straits exhibit occupied a large part of the right wing of the main building. Compared with the Malaya exhibit, Ceylon rubber made but a niggardly show. Most of the Federated Malay States and Straits Settlements exhibit had previously been shown at the Singapore Commercial Exhibition, where



HEXAGON OF THE MAIN BUILDING OF THE CEYLON RUBBER EXHIBITION; DECORATIONS OF THE CENTRAL CEILING, PILLARS AND FLOOR ARE FREE-HAND PAINTING BY KANDYAN ARTISTS



CEYLON RUBBER FACTORY.—MICHIE-GOLLEDGE COAGULATOR IN LEFT FOREGROUND, WASHING AND CREPING MACHINES IN RIGHT FOREGROUND; CREPE RUBBER HANGING FROM CEILING



CEYLON RUBBER FACTORY.—MICHIE-GOLLEDGE COAGULATOR ON LEFT WITH FRESHLY-COAGULATED RUBBER IN BASIN NEAR MACHINE; WASHING AND CRKPING MACHINE IN RIGHT FOREGROUND SHOWING CREPE RUBBER

the minimum quantity necessary for a full exhibit was 28 lbs., while at the Ceylon Exhibition 5 lbs. was the minimum. Thus it was that in most cases the States exhibits were fine commercial samples, while those of Ceylon were strictly *exhibition samples*.

The most striking exhibit in the Malaya section was the Para crepe block rubber exhibited by the Lanadron Estate, F. M. S. The blocks, which were 1′ square and 6 to 8″ thick, weighed 25 lbs. The general method of preparation is as follows:—

The coagulated latex is passed through the crepe machine. The crepe is dried in a vacuum drier and the long strips folded to a uniform size and subjected to a hydraulic pressure of 250 tons or more, until they become compressed to the required size. The time required for the entire operation is about 8 hours.

Ceylon Para was also on exhibition in the right wing, together with rubber from India, principally Castilloa and Ceara of inferior quality.

The fine exhibit by Messrs. Figgis & Co., of London, of the rubbers of the world, was located in the north wing. One case contained the South and Central American products, and another the rubbers of the African Continent. From this exhibit, the planter unacquainted with wild rubbers could obtain an excellent idea of the nature of these products as compared with plantation rubber.

The following exhibits were also shown in the north wing:—

Indian Forestry Exhibit.
Ceylon Forestry Exhibit (350 specimens of wood).
Tires and rubber tools. Messrs. Walker Sons & Co., Ceylon.
Chemicals used in rubber coagulation. Messrs. Cargills, Ltd., Ceylon.
Vulcanized Rubber. Mr. M. Kelway Bamber, Ceylon.
Lace and Embroidery. Nuns of the Good Shepherd Convent.
Carved Woodwork. Kandy Industrial School.
Chemicals and Manure. Messrs. Frendenberg & Co., Ceylon.
"Michelin" Motor Tires, etc. G. O. S. Hodgson. Ceylon.
Philippine Islands Exhibit.
Rubber Exhibit, Culloden Estate. (Gold Medal St. Louis, 1904).
Photographs. By different estates and photographers.
Books, Pamphlets, etc. A. M. and J. Ferguson, Ceylon.
Map showing climate and rainfall of Ceylon.

The left wing contained exhibits of Ceylon Ceara and Castilloa, and a small portion of the Para entries, together with rubber tools and accessories of all descriptions, from tapping knives to a model vacuum drying house. Other products from Ceylon, largely agricultural, were also shown in this wing. The most important of these were the following:—

Agricultural Implements.
Cocoa. (Pods of Caracas and Forastero and commercial samples of prepared chocolate).
Cocoa Beans.
"Karakkan," (A dry-land grain.)
Manioc. (A catch crop).
Cinnamon. (Gold Medal, St. Louis, 1904).
Dye-bark.
Products of the Cocoanut Palm. (Desiccated cocoanut and copra).
Palm Leaf and Fibre Baskets.
Sea Island Cotton.
Tobacco. (Prepared leaf, cigars, etc).

The machinery section had a special department to itself a short distance from the main building. Three engines, 8, 12 and 16 h. p., operated the machinery by means of a main shaft with the necessary pulleys and belts. The following machinery was installed in the building:—

2 Crepe Rubber Machines. Federated Engineering Co., Kuala Lumpur, F. M. S.
2 Reversible Barrels for Installing Bark Preparatory to Maceration. Messrs. Brown & Davidson, Ceylon.
1 Macerating Machine. Messrs. Brown & Davidson, Ceylon.
1 Combined Macerator and Crepe Rubber Machine. Messrs. Brown & Davidson, Ceylon.
1 Latex-Storing Tank. Messrs. Brown & Davidson, Ceylon.
1 Portable "Michie-Golledge" Coagulating Machine, Messrs. Walker & Sons Co., Ceylon.
1 Screw-Press for Blocking Rubber. Messrs. Brown & Davidson, Ceylon.
2 Rotary Strainers and Separators for Removing Impurities from Latex. C. O. Macadam; M. Kelway Bamber.
1 Latex Smoker. Messrs. Brown & Davidson, Ceylon.
1 Cotton Ginning Machine.
1 Citronella Oil-Press.

RAW RUBBER.—The uniform high standard of the samples of plantation rubber, and the variety of the tools, machinery and general planting accessories exhibited, shows the remarkable strides in the industry during the last few years.

Eastern crepe, sheet and block rubber is already far ahead of the so called *wild rubbers* produced by other countries in the form and condition in which the product is turned out, but elasticity and tensility, the paramount considerations in the eyes of the manufacturers, is still wanting. Para, hard and fine, when stretched and released, springs back instantly to its original shape and form. Plantation rubber, however, when stretched will not at once return to its original shape, but slowly resumes its form; this is its great fault. This fault no doubt is due to the treatment of the rubber. Time and experiment will probably find a solution to this problem.

Among the Ceylon rubbers especially worthy of note were the Para block and certain samples of Ceara. The rubber from this latter species was considered by the judges to be the finest at the exhibition. Also worthy of note was the crepe scrap and crepe bark scrap and flake block. Crepe scrap is the ordinary hand prepared scrap turned out through the washing and rolling machine, while crepe bark scrap is obtained from the tapping parings, and is usually of a darker color. Smoked Para in sheet, block and biscuit form attracted considerable attention. In this case, either the latex or the finished product may be smoked. Such smoking prevents tackiness or heating of the rubber on the surface.

Castilloa rubber is evidently not a favorite with eastern planters, as there were but two entries in this class.

MEDAL AWARDS.—Several Ceylon estates exhibited fine collections of rubber, that of the Culloden Estate, Neboda, deserving special mention. The exhibit consisted of the highest quality samples of block rubber, block from parings, flake block (smoked and unsmoked), scrap block, pressed crepe, finest crepe, smoked crepe, loose crepe, biscuits from 25 to 30 year old trees, tapping knives, comb prickers, collecting tins, Hevea seed and seed oil, etc. This exhibit was shown at the World's Fair at St. Louis (1904), winning the Gold Medal.

The Duckwari Estate showed Para rubber grown at high elevations, 2500 to 3000′, fine dark sheets; also amber biscuits and dark biscuits. This remarkable exhibit, which was awarded the Gold Medal for Para biscuits, caused no little surprise and interest among planters. Hevea had not been considered a high altitude tree up to this time. It is now thought that Hevea when planted at high elevations grows slowly, the bark taking longer to come to maturity, and for this reason gives a better quality of latex.

The Arapolakand Estate had an excellent case of block scrap, crepe bark scrap, smoked and unsmoked biscuits, dark, and pale, etc.

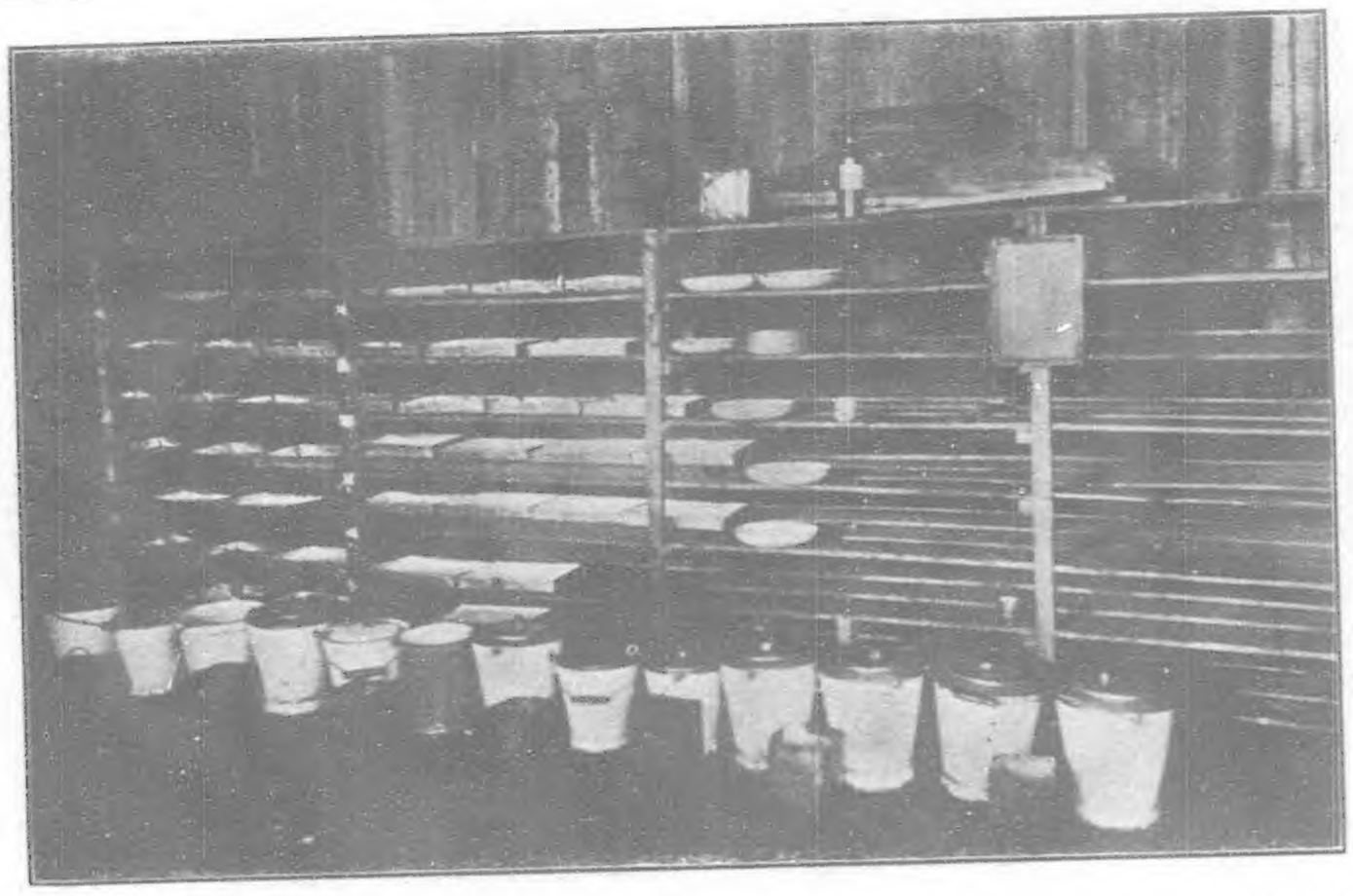
The best display of rubber was made by the Malay Peninsula—mainly due to the large quantity shown by each estate. Fine Para block rubber, washed and rolled crepe, large sheets, biscuits, blankets, *solution sheets*, etc., made a most comprehensive and excellent exhibit.

The Special Gold Medal for the best rubber from the Malay Peninsula was awarded to the Lanadron Estate, Muar, State of Johore.

There were but few entries in the Castilloa rubber class, the prize exhibit being a dark, black sample of block rubber from the Colloden Estate, Ceylon.

Ceara rubber class attracted only Ceylon exhibits, all of which were of fine quality. The lot which won the Gold Medal, and in competition with Para, received a Silver Medal in the class for the *best rubber at the exhibition*, was a number of large, thin sheets and biscuits from the Kondesalle Estate. The excellent showing of this rubber, and the good growth Ceara is known to make, will no doubt gain more attention for this species in the future.

The competition in the class of Rambong rubber was naturally confined entirely to the



CEYLON RUBBER FACTORY.—LATEX IN SETTLING OR COAGULATING PANS; TRANSPORT PAILS USED IN COLLECTING LATEX ON GROUND AT BOTTOM OF SHELVES

Malay Peninsula. The Gold Medal was awarded to an exhibit of crepe block shown by the Golden Hope Estate, Klang, Selangor, F. M. S.

Tapping knives, of which there were a large number on exhibition, may be roughly divided into two classes:—First, those adjustable to almost any degree; second, those fixed, and consequently not alterable by the tapping coolie. Paring knives and chisels of all descriptions were shown. The pricking tools were of two patterns, rotating ones, on the spur principle, and comb prickers. The latter style is considered with great favor by the Ceylon planters at the present time. It is a fact well worthy of note that the knives which received the highest awards were those belonging to Class 2 (unadjustable) mentioned above. Simplicity should be the key note in the invention of all instruments for cutting or paring, as a knife with a large number of adjustable parts is usually too complicated for the average coolie to comprehend. The knives receiving awards were all constructed with paring blade guards, to prevent deep cutting. Undoubtedly the best knife was that invented by W. T. Miller (awarded Gold Medal) which has no adjustable parts. The Bowman-Northway parer (awarded Gold Medal) has a detachable guard, which may be adjusted, however, without screws.

The best pricker (awarded Silver Medal) was that exhibited by C. C. Macadam, which was constructed on the comb pattern, with adjustable teeth. Bowman-Northway also showed a pricker (awarded Silver Medal) constructed on the spur pattern, with triangular guard.

General Observations.—*Rubber from macerated leaves, bark, etc.*—The extraction of rubber from the bark, twigs, leaves, etc., of Para, Ceara and Castilloa has been proven within the last few years to be a paying industry. At the present time there are in the East a number of estates which pay the total cost of tapping by the sale of rubber manufactured in this manner.

The macerating, washing and rolling operation, as carried on by the representative of Messrs. Brown and Davidson at the Ceylon Exhibition, is as follows:—

Dry bark, leaves and parings are placed in a large reversible barrel together with a quantity of water, in which the mass is allowed to soak, being frequently stirred, for 24 hours. At the completion of this time the *stuff* is taken out and passed through a compound macerating, washing and rolling machine. This machine consists of two revolving rollers, with a receiving trough beneath, upon which a constant stream of water is falling. The right hand portion of the rollers have spiral grooves cut along their length, and these rollers revolve, when the machine is working, at different rates of speed (20 and 12 r. p. m.), thus tearing up and grinding any material passing between them, all mechanical impurities being washed away through the fine sieve below. The mass is put through the machine repeatedly, until the rubber conglomerates in a lump. The left side rollers, revolving at the same rate, have circular grooves which do not have a tearing effect, but are intended for washing and creping the rubber. Two men are required to operate the machine. A ton of scrap yields approximately 7 per cent of rubber.

This machine will treat any tapping shavings and parings, dried bark, twigs and branches, as well as scrap rubber in any condition. It is thus adapted for the treatment of rubber vines, such as Landolphia, Clitandra, Parameria, etc., and would undoubtedly be suitable for the extraction of gutta percha. The extreme simplicity of construction, ease of working and combination of uses to which the machine may be put are especial points of advantage.

The cost of the combined macerating and washing machine is about ₱750 ($375 gold).

Handling and Packing Rubber Seeds for Export.—Para Rubber (*Hevea brasiliensis*).—The fruit of *Hevea brasiliensis* is a three-lobed capsule, containing three oval, brown speckled, shiny seeds. When unripe, the outer shell or capsule is perfectly green, but turns a brown color on maturity, at which time it splits and allows the seeds to fall to the ground.

The seeds are very perishable, and should be sown as soon after collecting as possible. If planting is unavoidably to be deferred for some time, they should be spread out on a cool, dry, cement or board floor, and thoroughly raked over frequently to prevent heating. If a large quantity of seed is to be stored for some length of time, it should be mixed with dry sand or charcoal and kept in a dry place protected from an excessive amount of sunlight.

For short journeys—a week or less—Para seeds may be sent in bulk through the mail without any packing, in a sack holding about 450 seeds and weighing 4 lbs. Where the seeds will probably be en route for from 15 to 30 days, it is usual to adopt a method which will retard germination. In this case a packing box, 30×15×12″, which holds from 5000 to 6000 seeds, is used. A thin layer of dry charcoal and cocoanut fibre or sawdust is placed on the bottom, covered by a layer of paper, in order to prevent the dry compost sifting during transit; then a layer of seeds, more mixture, another layer of paper, and so on. Two parts sawdust to one of charcoal forms a suitable mixture.

Another method is to pack the seed in sawdust alone, without the use of paper layers.

Excellent results have been attained by shippers in the Federated Malay States and Straits Settlements by packing Para seeds in boxes with damp powdered charcoal. Care is required in shipping by this method to get the charcoal moist all through, and neither too wet nor too dry.

For long distances a very satisfactory method of transportation is by Wardian cases. Instead of attempting to retard germination of the seeds, the object is to induce them to sprout, and with this end in view they are not packed but sown. If good healthy seeds are sown, germination should take place in about 10 days. En route to their destination, the seedlings may be tended in the box with the same degree of care that they would receive in the nursery bed, so that on arrival at their destination they should be good sized plants or stumps.

When it is desired to ship seeds by this method, the body of the Wardian case is filled to a depth of from 4 to 5″ with a light compost, consisting of leaf mould and sawdust in equal parts, or two parts leaf mould to one of decayed cocoanut dust, with a little charcoal; upon this is placed a layer of about 1000 seeds, a layer of compost one inch deep, and the whole mass well packed down. Bamboo twigs are then placed thinly on top of the earth, and narrow battens laid upon these, 6″ apart, being held in place by longitudinal strips nailed along the inside of the case on both sides. The twigs and battens are used to prevent the top soil from shifting during transit. The case is then set upon four bricks and the earth watered every morning and evening, ample drainage being secured through the cracks in the boards at the bottom.

It is the usual custom to germinate the seeds before shipping, the glass top-sides being left off until the last. These when screwed on admit sufficient light to allow the young plants



CEYLON RUBBER FACTORY.—ROLLING RUBBER BISCUITS



TAPPING PARA TREE, CEYLON.—FULL HERRINGBONE SYSTEM; DRIP TINS AT TOP OF CUTS; COLLECTING TINS ON GROUND; MAN ON RIGHT USING PARING KNIFE; MAN ON LEFT WATERING CUT SURFACE

to grow, while air is supplied by a ventilator at either end, which is covered with gauze wire, with a small box nailed on the inside so that the salt water cannot reach the plants. The percentage of germination by this method has been found, by actual experiment, to be between 95 and 98 per cent. The advantage of obtaining seedlings instead of seeds is that a year is gained in the planting operation.

Wardian cases cost in Colombo, Ceylon, Re. 15 (₱10). Cases planted with 1000 seeds and ready for shipment Re. 20 (₱13.35).

CEARA RUBBER (*Manihot glaziovii*).—The seeds of Ceara are enclosed in a capsule, containing three seeds which, when ripe, splits and scatters the contents. The seeds, which are of small size, have a little caruncle or wart at one end, and it is from this that the root emerges upon germination. The outer shell of the seed is very hard and unless the caruncle is filed with a rasp almost through to the fleshy part of the seed, germination may not take place for some considerable time.

On account of this slow power of germination, without treatment seeds may be shipped long distances by packing in sawdust or charcoal. The percentage of germination of Ceara seeds received in Zamboanga, Mindanao, P. I., from Ceylon averaged 75 per cent, seeds planted at stake. From two weeks to a month is required to make the journey from Ceylon to the Island of Mindanao, the time depending on the steamer, route, etc. Ceara seeds may be kept for several months by placing them in a dry, cool place, somewhat darkened.

CASTILLOA RUBBER (*Castilloa elastica*).—The somewhat fleshy fruit of Castilloa contains numerous small seeds, with a white papery coat, about ¾″ in diameter. Owing to the variable size, the number required to make a pound ranges from 800 to 1000. The seeds are very perishable if not removed from their flesh covering and cleaned of all pulp as soon as [illegible]ed.

[illegible]ping may safely be done by packing the seed[illegible] in charcoal or sawdust. If it is desired to k[illegible] them for several months prior to planting, they should be placed in a dry, cool room, and frequently stirred to prevent heating.

The Wardian case, already described, is ada[illegible]d to the shipment of seedlings of all the spe[illegible] of rubber mentioned.

[illegible]TIS OF DELIVERY OF RUBBER SEEDS.—Par[illegible]*ea brasiliensis*), May and June, October and [illegible]vember; Castilloa (*Castilloa elastica*), May and November; Ceara (*Manihot glaziovii*), available all the year.

Orders should be booked from 4 to 6 months ahead of the time of delivery. Following is a list of rubber seed dealers:—I. O. Macgregor, Seremban, Federated Malay States, (Para per 1000, ₱6 to ₱7); Director Botanic Gardens, Singapore, Straits Settlements, (Para rubber); J. P. Richards, Heneratgoda, Ceylon, (Para, Ceara, Castilloa. Germination guaranteed); J. P. Williams & Co., Heneratgoda, Ceylon, (Para, Ceara, Castilloa); Manager, Culloden Estate, Neboda, Ceylon, (Para rubber); J. D. Pereira, Orchard Row, Singapore, Straits Settlements.

CLIMATE AND SOIL REQUIREMENTS OF RUBBER TREES.—The best estimate of the soil and climatic conditions essential to rubber cultivation may undoubtedly be obtained by a consideration of these factors in countries where the various rubber producing species have already been grown with success.

PARA RUBBER (*Hevea brasiliensis*).—The Amazon rubber district, from which wild Para is obtained, extends over a vast area to the south and west of the Amazon River in South America. The climate of this region is noted for its uniformity, the mean annual temperature being 81° (Fahrenheit), with a maximum temperature of 95° F. at midday and a minimum of 74° F. at night. The mean annual rainfall of the district varies from 80 to 120″. From January to June is the rainy season, frequent showers, however, occurring during the remainder of the year.

In Ceylon and the Malay Peninsula, where Para is an introduced species, it grows well up to 10° north latitude. Many planters and rubber specialists claim that north of this point Para trees cannot be grown profitably on a commercial scale. This supposition, however, still remains to be proven, but if it be true, then there is but a small area of the Philippine Islands, north of the Island of Mindanao, where Para rubber may be cultivated.

Para has been grown successfully in Ceylon up to 3000′ above the sea. The mean annual temperature of the rubber district of the Colony varies from 70 to 80° F., and the mean annual rainfall from 75 to 160″.

It has been found in Ceylon that Para may be cultivated with success on soils relatively poor in chemical properties. The organic matter and combined water in these soils usually varies from 2 per cent to 30 per cent, potash from 3 per cent to 4 per cent, phosphoric acid from .01 to .10 per cent, and nitrogen from .10 to .50 per cent. Alluvial and forest soils are usually well suited for rubber growing. Stiff soils should be avoided. Swamp areas which have been effectively drained and made sweet by the application of lime, or burning, may also be utilized.

In the Federated Malay States, where the general mean temperature is 80° F., Para has been grown up to 2500′. The annual rainfall of the rubber district is 80″, although close to the high mountains 50 per cent excess of this amount is often registered.

The low-lying land at the foot of the mountains is composed of deep alluvial soil, the organic matter in which frequently exceeds 30 per cent, and the nitrogen .90 per cent. Other alluvial soils considered suitable for Para are formed from limestone, sandstone and granite.

The ideal soil for Para is that of low, alluvial flats full of decayed vegetable matter, where the temperature is between 74 and 94° F., and the rainfall from 80 to 150″.

CEARA RUBBER (*Manihot glaziovii*).—Ceara rubber in its native province of Ceara, Brazil, grows in a gravelly or sandy soil. The mean annual rainfall of this region is approximately 75″, and the mean annual temperature 72° F.

In Ceylon this species grows luxuriantly in the low hill district up to 3000′ elevation, and it is also said to thrive, when properly started, in the dry regions of the north and east of the island, where the rainfall averages only 50″ a year. Throughout the Para district small clumps of Ceara may be seen around almost every native house; the tree is also used extensively for hedges.

In the Island of Basilan, Moro Province, P. I., Ceara has made a remarkable growth on alluvial forest soil, at 1000′ above the sea, where the mean annual rainfall is 70.″

Ceara is said to be especially adapted to dry, sandy situations, and will stand drought well.

CASTILLOA RUBBER (*Castilloa elastica*).—Castilloa elastica is found growing wild in Mexico and throughout the Central American States. In its native habitat, the tree flourishes in a warm, moist climate, with abundant rainfall, and is rarely found above 1500′ elevation. It requires a deep, loamy soil, such as is found in valleys or on low ridges, but does not thrive on swampy ground or where the drainage is poor.

In Ceylon it has been found that Castilloa makes a poor growth on shallow, ill drained soils, but that it will grow well in a rich, loamy soil, with good drainage. The maximum elevation for planting varies from 1000 to 1500′.

In Mexico it is said to succeed best in deep, alluvial soil, somewhat sandy but not too dry. The soil should be well drained, but have sufficient underground moisture to enable the tree to withstand drought. The mean annual temperature should not be below 76° F. Five hundred feet is given as the maximum elevation for planting, it being reported that the tree does not produce latex in paying quantities at higher altitudes.

COST OF CLEARING LAND, PLANTING RUBBER, ETC. IN CEYLON.

*Peradeniya District.*

| | 1st year. | 2nd year. |
|---|---|---|
| Felling and clearing | *Re. 12.00 | Re. ..... |
| Lining and pegging | 2.00 | ..... |
| Holing | 6.00 | ..... |
| Filling and Planting | 3.00 | ..... |
| Plants | 1.50 | .50 |
| Weeding | 10.00 | 9.50 |
| TOTAL | Re. 34.50 | Re. 10.00 |
| | ₱ 23.00 | ₱ 5.66 |

*NOTE:—3 rupees equal $1 gold.

*Ambalangoda District.*

| | 1st year. | 2nd year. |
|---|---|---|
| Felling and clearing | Re. 10.00 | Re. ..... |
| Lining and pegging | 2.00 | ..... |
| Holing | 9.00 | ..... |
| Filling and planting | 7.00 | ..... |
| Plants | 1.50 | ..... |
| Weeding | 12.00 | 12.00 |
| TOTAL | Re. 41.50 | Re. 12.00 |
| | ₱ 27 66 | ₱ 8.34 |



TAPPING PARA TREE, CEYLON.—COLLECTING CUPS ATTACHED TO TREE CATCH ALL THE LATEX AND ARE THE UNIVERSAL SYSTEM IN USE IN RUBBER GROWING COUNTRIES OF THE WORLD



TAPPING PARA TREE, CEYLON.—USING A BOWMAN-NORTHWAY SPUR PRICKER TO OPEN LATEX TUBES IN WOUND OF A TREE WITHOUT REMOVAL OF ANY OF THE CORTICAL TISSUE

*Ambalangoda District (Low-land).*

| | 1st year. | 2nd year. |
|---|---|---|
| Felling and clearing | Re. 8.00 | Re. |
| Lining (20×20′) | 1.50 | |
| Holing (2×2×2′) and filling in | 9.00 | |
| Plants per 1000 | 2.00 | |
| Planting | 1.00 | |
| Weeding | 18.00 | 12.00 |
| TOTAL | Re. 39.50 | Re. 12.00 |
| | ₱ 26.34 | ₱ 8.00 |

*Kalutara District (Low country, jungle land.)*

| | 1st year. | 2nd year. |
|---|---|---|
| Felling and clearing | Re. 8.00 | Re. |
| Lining and pegging | 2.00 | |
| Holing and filling | 5.00 | |
| Plants | 4.00 | |
| Planting | 1.00 | 2.00 |
| Weeding | 18.00 | 16.00 |
| TOTAL | Re. 38.00 | Re. 18.00 |
| | ₱ 25.32 | ₱ 12.00 |

*Peradeniya District.*

| | 1st year. | 2nd year. |
|---|---|---|
| Felling and clearing | Re. 12.00 | Re. |
| Lining and pegging | 2.00 | |
| Holing | 6.00 | |
| Filling and planting | 3.00 | |
| Plants | 1.50 | 2.00 |
| Weeding | 18.00 | 16.00 |
| TOTAL | Re. 42.50 | Re. 18.00 |
| | ₱ 28.34 | ₱ 12.00 |

COST OF LABOR.—In an estimate of the cost of opening land in a central province in India, by Francis J. Holloway, the following statement is made:—"In some districts the coolie is paid 33 cents per day; in others 50 cents."

*Number of trees per acre at different distances.*

| DISTANCE OF TREES IN FEET. | NUMBER OF TREES TO THE ACRE. |
|---|---|
| 10×10 | 435 |
| 10×15 | 290 |
| 15×15 | 193 |
| 18×18 | 134 |
| 20×15 | 112 |

CULTIVATION OF RUBBER TREES.—If the planter desires to raise his own seedlings, a good piece of flat land, with water at hand, should be selected for the nursery site. The ground should be ploughed to the depth of a foot or more, the stones and roots removed, and the lumps of soil broken up. The plot should then be divided into beds 4′ in width, built up 12 to 18″ above the level of the ground, and smoothed off ready for planting. If the soil is poor, cattle manure or leaf mould may be added before sowing the seed.

From experiments made at the Botanic Gardens, Singapore, it was found that cow-dung was by far the best manure for seed beds, burnt earth and leaves coming next, while lime appeared to injure the young plants.

A temporary shelter should be constructed over the nursery beds by setting posts 8′ high in lines 10′ apart, and placing upon these cross bars sufficiently strong to support a layer of palm leaves, brush or matting, etc. If the seeds are planted in bamboo pots, the construction of the seed beds is unnecessary, the pots being placed on the ground under the shade frame. Where stumps are planted, bamboo pots are rarely used. A bamboo fence should also be constructed around the seed beds in order to keep out hogs and other wild animals.

Where seed has been delayed for some length of time in transit, it is advantageous to make a sprout test before planting. This may be carried on in the following manner:—

Erect a platform a few feet above the ground, and upon this stretch sacking or coir matting. On the matting place a little powdered charcoal to aid in retaining moisture. Place the seeds on the charcoal and cover them with more matting, water occasionally to keep the whole damp. Examine the seeds every day, and as soon as any show signs of germination, remove them and plant in pots or in the seed bed.

In large planting operations, seeds are often sown broadcast in the beds or planted out at stake. The usual method of planting, however, is to set them every 6″ in rows 6″ apart in seed beds. A small pointed stick may be used in making the holes for the seeds, which should be placed on their side and covered with soil to a depth of from one-half to one inch.

Para and Castilloa seeds are usually sown in nursery beds. Ceara seed, which—on account of its hard coat—requires filing at the caruncle end before planting, is in many cases set at stake in the permanent plantation.

After the seeds are planted, the nursery beds should be watered twice daily, in the morning and at night. Shade is required during the first month, but after that time it should be gradually removed. Plants two months old grow well in the open sunshine.

Para seed germinates in 10 or 15 days, Ceara in 20 days, and Castilloa in 3 weeks.

The seedlings may be set out when from 15 to 24″ in height in the permanent plantation, in holes 1½×2×2′. The soil of the prepared hole, which, if young plants are used, is filled in, should be slightly tramped down, and then a stake, several inches in diameter and 3′ long, forced into the center and worked around; the seedling put in carefully to the same depth that it was in the nursery and the soil pressed against the tap root by pushing the stick into the earth, somewhat at an angle, a few inches from the plant, pressing towards it and tramping around with the foot. Care should be taken to put the tap root in straight, not curled up, and to tramp the earth firmly around the roots. Planting should be done, if possible, at the beginning of the rainy season.

The plantation should be cultivated about once a month for the first two years in order to keep the weeds down. In newly cleared forest land, where it is impossible to use a cultivator, an area 4 to 6′ in diameter should be cleared of weeds with a hoe around each tree.

Close planting is no longer in favor in the East. The distance at present recommended in Ceylon and the Federated Malay States is 20×15.′ It was thought at one time that the best method of procedure was to plant 10×10′ or 12×12′ thinning out the extra and undesirable trees at the end of the fourth year. It has been lately proven, however, that by this method the growth of the whole plantation is retarded approximately one year, and that four year old trees (Para) do not yield a sufficiently good quality of rubber to pay for the extra expense incurred under this system.

If it is found necessary to keep the plants in nursery beds for six months or more, it is best to cut all the seedlings back to about 18 or 20″, when they reach a height of from 3 to 4.′ If planting is done in moderately dry weather, it is advisable to stump the seedlings, which process will aid the plant in withstanding drought. The seedlings should be cut back, as stated above, and all broken roots trimmed off above the injury before planting.

The land for the permanent plantation should be cleared thoroughly and as many tree stumps as possible either removed or burned. It has been found in Ceylon and the Federated Malay States that a fungus (*Formes semitostus*), which is especially harmful to Para rubber, is developed on jungle stumps and from these spreads to the rubber trees. If the area has previously been cleared, it should be well ploughed and disked before planting operations are begun.

Large plantations should be broken up into blocks by belts, 20′ wide, of jungle or cultivated trees. These belts will not only serve as a protection to the trees against heavy winds, but will also prevent the spread of injurious insects and fungi. Dapdap and Albizzia trees may be used to advantage both for windbreaks and also as shade trees for Para in sections subject to long dry spells. The shading of rubber, however, is of minor importance in the tropics, owing to the absence of severe droughts. Para usually makes a better growth if given a light shade during the first and second years, but after this period shade is not necessary.

Dapdap may be propagated by planting cuttings between every two rubber trees. The best results are obtained from cuttings several feet in length and between 1 and 2″ in diameter planted a foot deep.

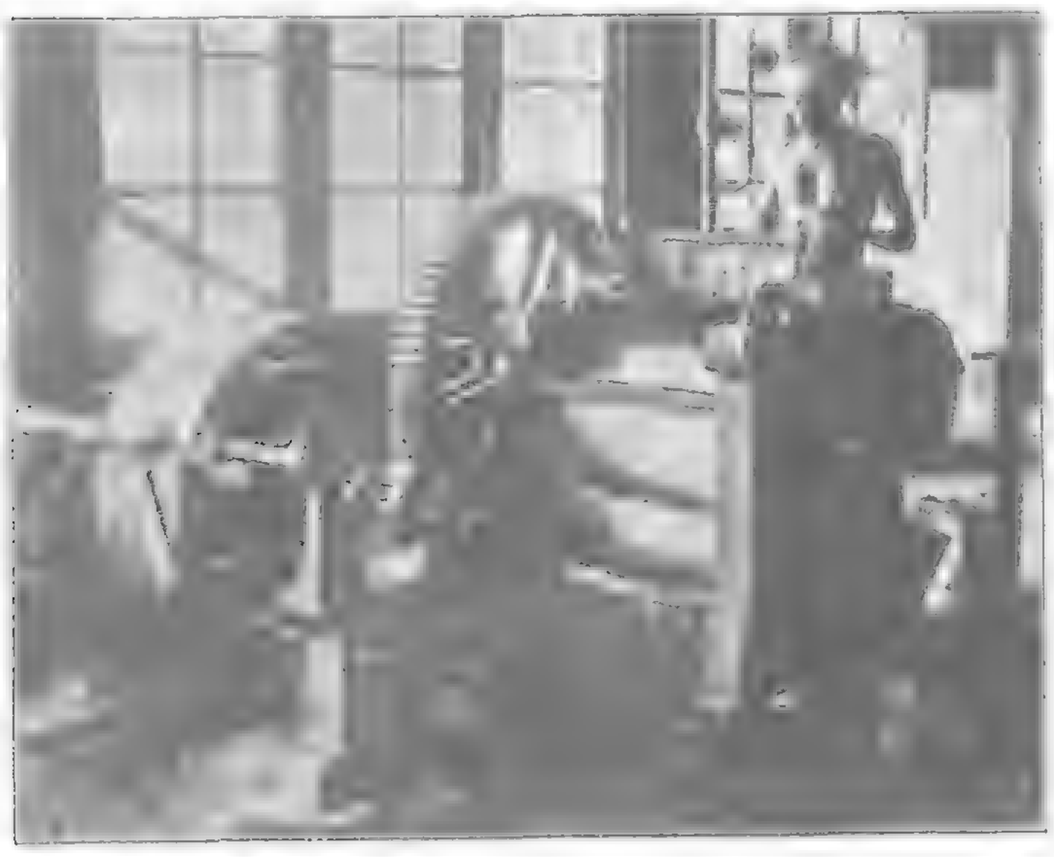
Albizzia trees are more difficult to start from cuttings, and do not produce such an abundance of plant food as Dapdap, although they are very rapid growers.

Para, Ceara and Castilloa should be pruned by removing the terminal bud with a knife or the thumb-nail when the trees are 10 to 12′ in height. This will prevent them growing tall and slender and will also give an increase in circumference, which will allow the trees to be tapped at an earlier period. If the terminal and lateral branch buds are repeatedly removed, the result will be a tree with a short bole, considerably forked, and supplied with an abundance of foliage. As tapping is rarely done above 6,′ this is the ideal form of tree sought after.

The manuring of rubber trees is carried on from the time the plants are 6 months old. The main object of this operation is to increase the cortical tissues of the stem from which the latex is obtained. Taking Para as an example, we may say that the rootlets grow radially from 10 to 15″ or more per year, depending on the soil, situation, etc. The manure should be distributed in such a manner that it will be of the greatest benefit to these rootlets.



TAPPING PARA TREE, CEYLON.—FULL SPIRAL SYSTEM OF TAPPING; COOLIE PARING BARK WITH A GOLLEDGE KNIFE



CEYLON RUBBER FACTORY.—WASHING MACHINE; RUBBER PASSES THROUGH TWO GROOVED ROLLERS REVOLVING AT DIFFERENT RATES OF SPEED, UPON WHICH A STREAM OF WATER IS CONSTANTLY PLAYING



CEYLON RUBBER FACTORY.—DRYING ROOM; CREPE RUBBER TO LEFT; BISCUITS ON LOWER TWO SHELVES; CREPE FOLDED READY TO BE PRESSED INTO BLOCKS, ON FLOOR; FLAKE RUBBER ON UPPER THIRD SHELF

ech are the feeders of the tree. When le manures, such as sodium and potassium rates, sulphates, etc., are used, they should mixed with dry earth and forked in over area covered by the young rootlets. If ttle manure or leaf mould is used, however, is customary to dig a wide trench a foot or re deep, mixing the manure with the soil t within reach of the newly formed rootlets. ien the root systems of adjacent trees have et, the manure may be broadcasted between rows and the ground well forked

Many planters object to trench manuring, uming that it is impossible not to injure the wly formed roots. In such cases, green soiling herbaceous plants is recommended, as e may be cut, thrown on the ground and wed to decay without forking the soil n species as *Crotalaria striata D. C., Crotalaburnifolia L., Crotalaria incana L., indicus Sprong*, etc., may be used for urpose. These plants give a good soil keeping the weeds in check, and also luce a large amount of plant food. As ty of these species are shrubby, they will pruning about three times a year. Plantnay be done by casting from 10 to 20 lbs. ed broadcast per acre among the rubber Besides shrubs, certain trees, such as (*Erythrina sp.*) and Albizzia moluc're often used for green manuring. After have become properly started, the trees l be pruned every month and the leaves ranches allowed to rot on the ground.

th rubber planted at a distance of 20×15′, often desirable to have an inter or catch Cassava, bananas, cacao, coffee, pepper, o and cotton are the products most used such conditions. Hemp is also being at the present time as a catch crop with rubber, at the San Ramon Farm, Moro e, P. I., but it is too early as yet to ine whether it is a suitable inter crop From the graphic representation of t system of Para, Castilloa and Abacá, ld seem that these species could be sucly grown together for a few years at Rubber trees have a rapid growing, t root system, which allows the profittivation of catch crops for about four

l noted estates in the Federated Malay have practically paid all working exy cultivating cassava, as a catch crop irst four years, with rubber. On the l, there are a number of cases on n the Malay Peninsula where tapioca ber planted together have resulted in or growth of the latter species. Taponsidered by many as a very exhaustive crop. Without doubt a considerable quantity of plant food is removed from the soil when the roots are dug out, but the injurious effect could undoubtedly be minimized by wide planting of the rubber trees, the cassava being confined to a limited area in the center of the rows. With rubber planted 15×15′ and cassava 6′ apart between the rows, the first crop will be ready to harvest in about 18 months, and the second crop at the end of the fourth year

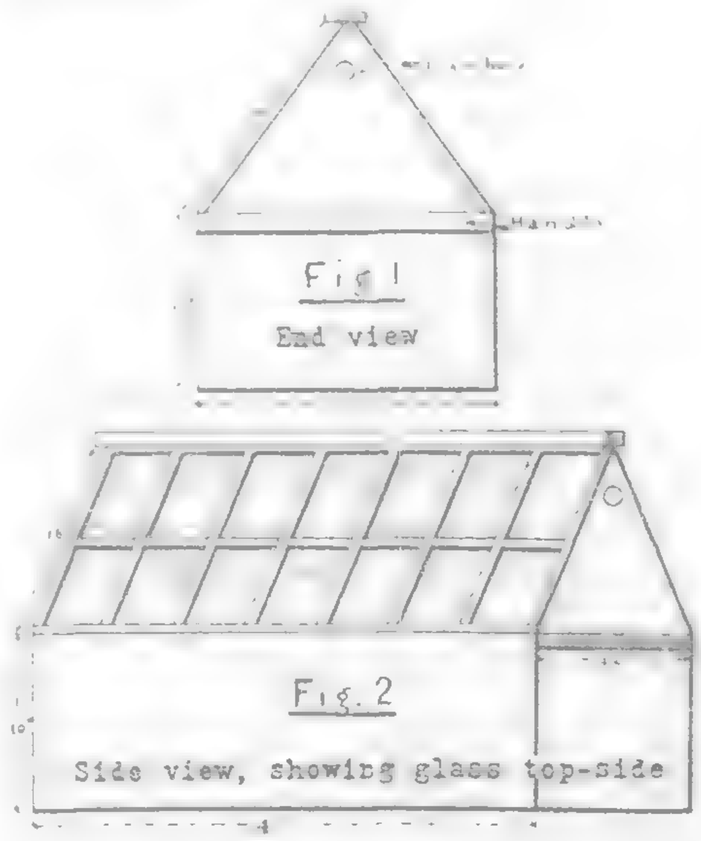
Cacao and coffee planted with rubber, in the middle of the lines, 10 to 20′ apart, will last for several years The protection which the rubber trees afford cacao against drought makes these species especially adapted to be grown together.

Cocoanuts grown with rubber do not do well on account of the rapid growing root system of both species.

ANNUAL YIELD OF RUBBER.—The annual yield of the different rubber producing species is in general as follows

Para rubber (*Hevea brasiliensis*);—"Trees from 4 to 6 years old, having a minimum circumference of 20″, may be expected to yield an average of 1 to 3 lbs. of dry rubber per tree each year up to the 10th year, and a higher yield in subsequent years."—*Herbert Wright*

Ceara rubber (*Manihot glaziovii*);—"An annual yield of 1 lb. of dry rubber is perhaps about the average for mature Ceara trees." *Herbert Wright.*




WARDIAN CASE

Castilloa rubber (*Castilloa elastica*);—Mature trees, 7 years or over, yield annually from ½ to 1 lb. of rubber. Old trees, 25 years, yield 3 lbs. or more per year.

COMPARISON OF COMMERCIAL VALUE OF DIFFERENT RUBBERS.—Para, Ceara and Castilloa all yield rubber possessing a high percentage of caoutchouc, the component on which the real value largely depends. In Ceylon, Para prepared in the ordinary way possesses from 90 to 95 per cent of caoutchouc, the samples of Ceara and Castilloa have from 75 to 90 per cent.

In view of the present boom in rubber in Ceylon, the Federated Malay States, Straits Settlements, Java, Borneo and India, the question is often asked as to which is the best species to cultivate. In Ceylon, the chief center of plantation rubber at the present time, it is considered by those who are vitally interested in the industry that where Para rubber will grow it can be cultivated as the mainstay of the estate. Para rubber trees grow rapidly, are very hardy, stand the tapping operation well, and yield a rubber of high quality

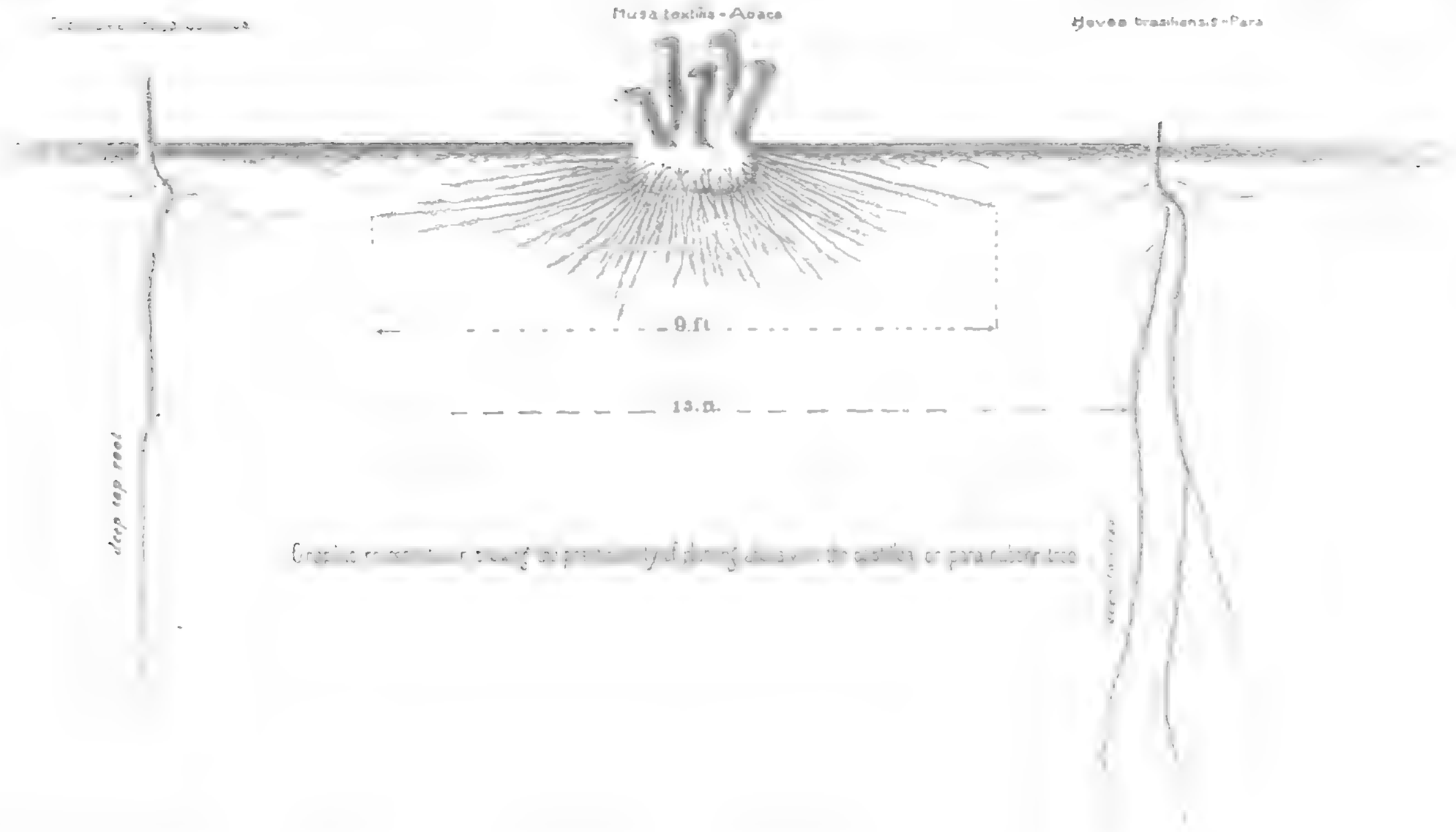
"The rate of growth and present immunity from pests of *Hevea brasiliensis* put it, in Ceylon, above Funtumia (*Funtumia elastica*); its yield places it on an equal or even higher plane than the best Castilloa (*Castilloa elastica*) from Panama or Mexico, and its hardy characteristics and response to the extensive use of the ordinary tapping knife render it superior to Ceara and the other rubbers."—*Herbert Wright* in lecture at Ceylon Rubber Exhibition.

In discussing when tapping may first be done, it is necessary to take into consideration the age and size of the tree. If the tree is less than 20″ in circumference, 3′ above the ground, tapping is not recommended, as the available working area of bark is too small to yield profitable results. The production of new tissue is also a great drain on so young a plant, and is liable to prove injurious.

In Ceylon, India and the Federated Malay States, Para trees 6 to 7 years old are considered mature for tapping.

Ceara trees have been successfully tapped in India when 2½ years old, and a fair quality of rubber produced. It is usual, however, to wait until the trees are from 4 to 6 years old, at which time a high grade rubber is obtained.

The value of rubber from Castilloa depends, in almost every case, on the age of the tree. Young trees produce a sticky, resinous rubber of inferior quality. In the Federated Malay States it has been found that rubber cannot be obtained in paying quantities until the trees are at least 7 years of age. In India, however, by careful washing a good quality of rubber has been obtained from trees 4 years old.




RUBBER-PRODUCING CENTERS OF THE WORLD.—The three great rubber producing centers of the world at the present time may be broadly classified as follows:—(1.) East Indies: British India, Ceylon, Burma, Federated Malay States, Straits Settlements, Java, Borneo, etc.; (2) Africa: Numerous foreign possessions and free states along the coast of Africa; Madagascar; (3) Mexico, Central and South America.

## ELECTRIC POWER TRANSMISSION, CALIFORNIA

The Stanislaus Electric Power Company, through its working concern, the Union Construction Company, has just closed a contract for an electric power transmission scheme of extreme importance to California industries. The site of the proposed plant is at Vallecito on the Stanislaus River near Angels Camp, Cal., and the scheme contemplates the utilization of the waters of the Stanislaus River, transmitting the power electrically to San Francisco, and incidentally tapping the Southern Mines and the Upper San Joaquin Valley. From a hydraulic standpoint the proposition is of peculiar interest as it involves the largest power units that have ever been used for impulse wheels. The operating head is 1,400′, equivalent to a pressure of 608 lbs. per square inch. The present equipment calls for three 6,700 kw., 400 r. p. m. General Electric generators, each of which will be driven by a Pelton waterwheel unit of 12,000 h. p. capacity. Not only are the individual units larger than heretofore attempted, but the capacity of the station in excess of 36,000 h.p. is greater than any existing at the present time. The only instance approaching this in impulse waterwheel practice is the Plant of the Puget Sound Power Company, at Electron, Wash., in which are installed four Pelton waterwheel units, each driving a 3,250 kw. generator, with a combined maximum capacity for the station of 30,000 h. p.

The units for the Stanislaus plant will be of the double *overhung* construction, characteristic of Pelton design for high power practice. Each unit will consist of two Pelton wheels, each overhanging the opposite end of a heavy shaft which carried the rotor of the generator in the center. Some details of construction covering these immense units may be of interest.

The wheels proper each consist of caststeel annealed disc-center to which are attached the Pelton buckets, also of caststeel. The buckets will be secured to the center by means of turned-steel bolts hydraulically pressed into reamed holes—a novel point in waterwheel construction. The shaft will be fluid-compressed hollow-forged nickel steel, 28′ in length, 20″ in diameter at the center where the rotor is located, and 16½″ at the waterwheel journals. The wheels and rotor will be designed for a press fit on the shaft at 100 tons pressure. The journals, one on either side of the generator, will be larger than any heretofere designed for this class of work, being 16½″ in diameter by 60′ long. They are of the ring-oiling, ball-and-socket type, water-jacketed and provided with an oil-pressure and gravity-feed lubricating system. Also there will be furnished electric thermostats and indicators to give warning of an excess rise in temperature. The nozzles will be of the needle-deflecting type, admitting of close regulation and water economy, and are of caststeel, as are also the gate valves. These latter will be of the single-disc Pelton type with phosphor bronze seats ground in place. They will be provided with roller bearings to relieve the thrust on the stems, and will be actuated through gearing by means of small Pelton motors. At the switchboard will be located the main pilot control, by means of which the operation of gates, nozzles and needles may be under the immediate control of the station attendant, small Pelton motors and direct acting plungers being employed for this purpose. All pressure parts on these units are to be subject to a cold-water test of 1,200 lbs. per square inch in the shops before shipment. The equipment will represent the highest development in hydro-electric transmission, and the installation is looked forward to with the greatest interest by engineers generally.

This contract is under the direct supervision of the engineering firm of Messrs. Sanderson & Porter, New York City, the complete equipment being furnished by the Pelton Water Wheel Company, and the electrical apparatus by the General Electric Company. Indications are that the year 1907 will eclipse its predecessor in the development of hydro-electric power transmission. The Pelton Water Wheel Company reports unusual activity in this direction and will carry over unfilled orders aggregating the largest in the history of its business. The market tendency is towards high speed, large power units. For example, the California Gas and Electric Company is installing a Pelton wheel of 10,500 h. p. maximum capacity. The Telluride Power Company, of Colorado, is adding to its equipment one 5,000 h. p. Pelton wheel under 1,800′ head. This company has installed a continuous lapweld, high-pressure pipe made by the Ferrum Company, of Germany, which the Pelton Water Wheel Company has introduced in America with much success in the last two years. The Siskiyou Electric Power Company has ordered two Pelton wheel units, each of 2,000 h. p. capacity, these being in addition to its present waterwheel equipment

## THE MALAYAN MINER

Says a British authority on mining conditions in the Federated Malay States:—"The Malayan miner in the Federated Malay States has two bad qualities- possibly, one or two more. He still holds human life dirt cheap when he gives reins to passion, and he is probably the most inveterate and incurable gambler on earth. When, consequently, bad luck attends his speculations, there is always danger of his squaring accounts with Fate by miscellaneous stabbing. Running amok is regarded in the peninsula as the natural sequitur to losses at play. Here, then, would appear to be a most promising opening for that Radical reforming zeal which, in the case of certain other Asiatic miners, would expel Nature—and the toilers themselves—with a fork. But there is one code of morality for Malaya, and quite a different one for the wicked Rand. It is proposed by the Colonial Office to confine the prohibition of the gambling farms in Malaya to non-mining areas, leaving them in full operation elsewhere. By this curious method of discrimination, the revenue derived from letting the farms, usually to Chinese speculators, will be maintained, while should some thin skinned Radical protest against the vice being turned to account for State profit-making, it will be pointed out how gambling farms have almost vanished from the non-mining districts, where they have never been in nearly so much request."

## MOTORS IN THE FAR EAST

Writing to the Bureau of Manufactures of the Department of Commerce and Labor at Washington, Mr. D. F. Wilber, American Consul-General at Singapore, states as to conditions in Singapore, the Straits Settlements, Federated Malay States, and the islands of Sumatra, Java, and Borneo, the motorcar trade is yet in its infancy. In Singapore there are at present about 60 passenger machines and some 15 or 20 freight carrying lorries. The only representatives of American cars are one or two Oldsmobiles and one or two Reo cars. The balance are entirely English and French in manufacture.

In the City of Singapore the cars are practically all owned by doctors, professional men, and some few motor enthusiasts, and the interest in motor trade grows daily. The field being practically uncanvassed for many years, it has not yet been thoroughly gone over, nor have the majority of the right people been approached for the sale of motor cars. The roads are excellent, being entirely macadamized, and are constantly cared for by the Government; in some portions of the city the gradients run from 2 to 30, and in no instance are the roads less than 60′ wide. To obtain a license to drive a motorcar or a motorcycle, one must apply and pass an examination before the Chief of Police, and if, in his estimation, the candidate is capable of handling a car, the license is granted on payment of a fee of $1 Straits currency, equivalent to 56 cents United States gold. The drivers, outside of Americans and Europeans, are mostly Chinese and East Indians.

The demand for motorcars is increasing, and aside from Singapore it is growing extensively in the Federated Malay States and in Sumatra and the other islands in this vicinity. The Chinese and natives take to motoring very kindly; their chief interest being centered in the decorations and color of the body of the car rather than in the ability or workmanship of the engine. The worst difficulty in this part of the globe is the constant heat, which, by the way, is in no way more oppressive than the heat in New York and Chicago in the early summer. This causes constant tire troubles, and while the majority of cars are equipped with pneumatic tires they are now putting on clincher tires, taking the risk of injury to the engine and car in preference to constant purchasing of new tires. At present there is one fairly good garage at Singapore; besides this there is a motor engineer expert from home who is passing upon defects and breakdowns that occur and handing them over to the garage people, which permits of the same care and attention to the cars that one gets in the States. It is possible to get extra parts, casting, and other special work made in the local machine shops, so that one really does not suffer much from being so far from the headquarters of the various factories.

The favorite car for these parts is a 4-seated 10 to 12 h. p. double cylinder; and although there is no speed limit, there is not much *scorching*. Gasoline can be had in any quantity and fairly cheap, as there is any amount brought from Sumatra. The motor spirit is not so heavy as the American article, there being a tendency for evaporation and leaving water in the bottom of the tank. This, however, is rapidly getting better.

The cars in use, with the exception of one or two, have no magnets, but rely entirely upon accumulators and coils for the spark. An enterprising magnet manufacturer could do an excellent business if he entered the field and his batteries were right, as battery troubles are very common. Lubricating oils are all first-class and very little trouble occurs through that source. The air-cooled motor here is not a success, the weather being entirely too warm; the radiators upon the water-cooled machines are sometimes remain hot for days at a time. The conditions in the islands of Sumatra, Java, British North Borneo, and also the Federated Malay States are practically the same as in Singapore. Owing to the absence of railway accommodation, and in most parts there being no railway at all, the Government has spent a great deal of money on making excellent roads, and the rich natives are in prime condition for the purchase of these commodities, notwithstanding the stiff prices for American-made cars. English and French manufacturers are reaping the harvest, and will continue to do so for some years to come, unless the difficulties referred to as to prices, freight rates, and delivery are overcome.

The whole proposition summed up resolves itself into one of two things—either American manufacturers must bring pressure to bear upon the steamship companies in order to lower the freight rates, and they themselves be a little more prompt in deliveries for the eastern trade instead of sidetracking Eastern orders in favor of those closer to home, or else they must figure so that a part of their profit is cut down, so the machine is delivered here at such a figure that the American agent can enter the field on the same basis as the foreign agents. Until this is done the American-made cars will always be in the minority. Even the tire manufacturers can not compete with the foreign agents, and this portion of the motor business is the best paying out here.

The motor-boat business is being pushed mainly by an American manufacturer's agent, and there are quite a few being sold, but the main opening and the big business is for horseless vehicles.

On this automobile question an American house has prepared for Mr. Wilber the following statement: Among the rich Chinese who have taken to automobiles, one at Kuala Lumpur owns four French cars. There is hardly room for great extension of automobiles for pleasure purposes in Singapore, for the island is small and there are no opportunity for making long runs. The roads are good practically all over the island, but motoring becomes rather monotonous in a limit of 35 or 40 miles. There is a field for automobiles for freight carrying. These have been operated very successfully in the Federated Malay States and could be used more generally in Singapore. One firm has four of these motors in use in Singapore for delivering goods in cases, and it is only a question of a very short time when other concerns will follow suit. At present practically all the deliveries of goods from the wharves, in some cases covering distances of from 3 to 3½ miles, are made by bullock carts, which are slow, of limited capacity, and sometimes hard to get.

One thing that has militated against the introduction of motors for commercial purposes has been the extraordinary high price of benzine, but the price has been reduced from 42 cents gold to 28 cents gold per gallon. Even this is too high, as up to within two years benzine was a waste product in the Dutch oilfields and was thrown away. The efforts made to popularize motor launches and stationary gasoline engines led to a reduction in price. When we can get the local price down to 14 or 17 cents gold a great impetus will be given to importation of motor trucks, as it will cheapen their operation.

"There are two things which are going to hamper us very much in the introduction of motor trucks from the United States," says Mr. Wilber, "the high ocean rates now being enforced by the shipping combine, and secondly, that we can not depend upon deliveries from American manufacturers in a reasonable time. The buyer of a firm, formerly one of the biggest importers of American manufacturers' goods, recently informed me that his indents to America now were not 10 per cent of what they were four years ago, simply because he had to wait eight to 10 months, and sometimes a year before he could get his goods (he was speaking particularly of machinery). It simply drove his firm to look out for other machinery that would take the place of American, and in some cases to buy American machinery from second hands in Europe at higher prices, because in that case he could depend upon delivery within a reasonable time. Just so long as we have to depend upon our present uncertain steamship service from New York direct to the Straits Settlements, the present high rates, and the indifference of American manufacturers, we shall have difficulty, not only in introducing new lines but in holding our own on lines which we have already established."

## SUGAR-REFINING IN JAPAN

According to the *Japan Chronicle* the sugar-refining industry in Japan has made much progress in recent years. The principal factors that have brought about the development are attributed to an increased consumption in the country, the increasing demand abroad, the effect of tariff legislation, and protection of the industry in Formosa. Despite the opinion which was expressed to the contrary, in some quarters, optimistic views seem to be generally entertained among those who are concerned in the business as to the future of the industry. Hitherto the large sugar manufacturers in Japan have been the Nippon Seiseito Kaisha, of Tokyo, the Nippon Seito Kaisha, of Osaka, the Dairi and the Formosa Seito Kaisha. Their total capital up to last year did not exceed -Y-9,500,000. The first and second companies mentioned above have since amalgamated and the capital has been increased from -Y-5,500,000 to -Y-12,000,000. The Formosa company has also increased the capital of -Y-1,000,000 to -Y-5,000,000 while the Dairi concern is contemplating taking a similar step and bringing up its capital to -Y-4,000,000. The capitalization of these companies will stand thus:—

| | *Before increase* | *After increase* |
|---|---|---|
| Nippon Seiseito.. | -Y-5,500,000 | -Y-12,000,000 |
| Dairi Seito..... | 3,000,000 | 4,000,000 |
| Formosa Seito.... | 1,000,000 | 5,000,000 |
| | -Y-9,500,000 | -Y-21,000,000 |

Thus, the capital of the three existing companies has been more than doubled within a short space of time. Turning to the starting of new companies, the following are the leading ones:—

| | *Capital.* |
|---|---|
| Yokohama Seito..... | -Y- 1,500,000 |
| Toyo Seito..... | 5,000,000 |
| Nagoya Seito ..... | 1,000,000 |
| Toa Seito..... | 2,000,000 |
| Meiji Seito..... | 5,000,000 |
| | -Y-14,500,000 |

Besides these, there are several other smaller sugar manufacturing companies that have been established or are under project with a capital under -Y-1,000,000, but these have been left out of account. When the increased capital of the old and the capital of the new companies are put together a total is formed of -Y-26,000,000, which, compared with the capitalization of -Y-6,500,000 at the end of last year, shows an increment of 370 per cent. The condition of the sugar industry in Japan, as judged by the amount of capital invested, is as follows:—

| | *Paid-up capital* |
|---|---|
| 1899 ... | Y 1,[illegible]4 |
| 1900 ..... | 2,591,000 |
| 1901 ..... | 2,737,800 |
| 1902 ..... | 2,648,500 |
| 1903 ..... | 2,710,300 |
| 1904 ..... | 3,564,800 |
| 1905 ..... | 4,932,800 |
| 1906 | 10,061,800 |

As shown above, the industry has made nearly treble progress during the last three years as far as the capital is concerned and though no doubt much of the capital is invested in fixed property such as plant and buildings there can be little question that the manufacturing capacity has been materially augmented. The importation of foreign sugar from 1900 to 1904 is shown below:—

| | *Brown* | *Refined* |
|---|---|---|
| | 1,000 *kin.* | 1,000 *kin.* |
| 1900 ..... | 209,178 | 195,390 |
| 1901 ..... | 228,182 | 264,265 |
| 1902 ..... | 178,446 | 85,366 |
| 1903 ..... | 294,985 | 97,363 |
| 1904 ..... | 338,921 | 71,553 |

The gradual decrease in the importation of refined sugar as shown above and the increase in brown is manifestly the result of the progress of the Japanese industry.

Japan's Foreign Trade. [illegible] According to the Tokyo correspondent of the *North China Daily News* Japan's trade returns for [illegible] show that exports amounted to -Y-442,593,348, an increase -Y-101,059,788 or 3.1 per cent compared with 1905, and imports to -Y-418,471,401, a decrease of -Y-70,066,616 or 1.4 per cent. This implies an excess of exports over imports of -Y-4,121,947 against an excess of imports over exports of -Y-167,004,407 in 1905, and the total exports and imports stand at -Y-841,064,749, an increase of -Y-31,886,298 or 0.3 per cent. The decline in imports last year was only due to the discontinuance of the importation of war materials. Foreign trade for the year is remarkable in respect of the unprecedented total [illegible] of imports and exports and of an excess of exports for the first time during the last 10 years.

# GROWTH OF THE KIANGNAN DOCK AND ENGINEERING WORKS.

The Kiangnan Dock and Engineering Works, one of the most enterprising and ably-conducted concerns of its kind in the Far East, is situated on the left bank of the Whangpoo River, about 3½ miles from Shanghai. The premises now occupied by the company originally formed part of the Imperial Chinese Government Arsenal and Dockyard, at Kiangnan, and is still contained within its walls, although the



KIANGNAN DOCK WITH A CHINESE CRUISER ON THE WAYS

establishments are now quite separate. The arsenal and dockyard came into being about 40 years ago, to meet the requirements of the Chinese Government for the manufacture of cannon and the repair of the few small ships of war it possessed at the time, and has gradually grown to its present splendid dimensions. About 18 months ago the dockyard portion of the arsenal, comprising an area of about four acres lying between the steel works and gun factories and the Whangpoo, became separated from the arsenal and was taken over by the present company and launched as a going commercial concern. The directors of the Kiangnan Dock and Engineering Works are Admiral C. P. Sah and Captain Y. K. Woo of the Imperial Chinese Navy, and Mr. L. Basse. The manager is Mr. R. B. Mauchan, formerly of the engineering staff of Messrs. S. C. Farnham, Boyd & Co., Ltd., of Shanghai, of which the present Dock and Engineering Company, Ltd., is the successor. All of these gentlemen enjoy a high reputation in the marine engineering field of the Orient and the rapid growth of the business of the Kiangnan works is the best testimony of their ability and enterprise.

DRYDOCK.—The drydock, which was very small and totally inadequate for the purposes the company had in view when it took over the works, was first given attention. It was lengthened about 40′ and deepened 3′, the bottom newly piled and decked, and new reel blocks installed throughout. The somewhat antiquated pumping machinery was removed and a new modern pumping plant installed, consisting of two 20″ and one 10″ centrifugal compound pumping engines. The pumping plant is contained in a large steel tank sunk about 12′ into the ground and rests on a huge concrete foundation. Steam is supplied by two large Lancashire boilers arranged with separate flues and funnels, while an auxiliary boiler of the marine type is fitted for use in case of emergency –all with a working pressure of 100 lbs. per square inch. A feedwater heater with feed pumps of the Worthington type in duplicate is supplied for feeding the boilers The pumphouse, though built primarily for housing the boilers and pumping machinery, also contains the dynamo engineroom, together with lavatory and bathrooms for the convenience of the crews of the ships using the dock; dock tool store, etc. On either side of the dock entrance are wharves alongside of which ships entering or leaving the dock, or refitting, can lay. On the upper wharf is fitted a pair of heavy sheerlegs, capable of lifting 60 tons with boiler and winding engine complete. In the river and right abreast of the company's premises are three buoys for the accommodation of ships undergoing repair.

BOILER SHOP.—Passing up the side of the dock and bearing a little to the left one comes to the shops where towboats, launches and other small craft are hauled up for repair; and nearby is the boilershop with its punching, shearing plate-bending, angle iron-bending, plate edge planning and drill machines; plate furnace frame-bending floor and the usual accessories of a modern boiler shop. The machinery this shop is driven by a large Tangye engine while alongside of it is another engine of similar dimensions which is kept ready for immediate use in the event of an accident happening to the former. Steam for these engines is supplied by two large Lancashire boilers

RESIDENCES AND GENERAL OFFICES.—Beyond the head of the drydock and the carpenter shop, mould loft and a number of huge godowns used for the storage and seasoning of timber stands a handsome building recently erected one wing of which is to be used as a residence for the foreign employés of the company and the remainder as a residence for Chinese students while the basement floor is occupied by billiard and reading room, offices, etc. Nearly opposite this building are the company's offices, the ground floor of which is occupied by the directors the managers and accountants, while the whole of the upper story is devoted to the designing and drawing staff.

MACHINE SHOP.—Just over the way from here is the machine shop, a large and commodious building, which is served by a 40-ton travelling crane supported on columns with steel girders and running the whole length of the shop. The heavy lathes and planing and boring machinery are placed on either side of the central aisle where they can be easily and rapidly served by the travelling crane, while the two side bays are filled with the smaller lathes and machines.

On first entering this fine shop one's attention is immediately taken by a huge triple-geared face lathe manufactured by Messrs. Craven Bros., of Manchester, the chuck of which is capable of taking in a piece of work 10′ in diameter by 3′ in length. Next to this and in a line with it, is another heavy triple-geared sliding-surfacing screw-cutting lathe, also by Messrs. Craven Bros., 25″ centers and capable



GENERAL VIEW OF THE DOCK



MACHINE SHOP SHORTLY BEFORE COMPLETION



RIVER VIEW OF THE WORKS



EAST WHARF FROM DOCK ENTRANCE

of taking in a piece of work 32′ in length, which with its two double-slide rests carrying four tools, all of which can be put in operation at the same time, render this a very valuable machine indeed. Next comes a heavy horizontal drilling and bolting machine with two massive boring heads, each of which can be worked independent of the other, and capable of doing a large variety of work. Immediately adjoining this is a vertical planing machine with horizontal traverse, which can take in a machine a piece of work 10′ 6″×16′ long. A large horizontal planing machine comes next, and several smaller machines. The other side of the shop under the crane is similarly fitted with heavy machines, among which are a heavy American slotting machine and two useful horizontal boring machines. The side bays, as has been mentioned before, are closely packed with a large variety of lathes and planing, slotting, screwing and drilling machines, manufactured by Archdale, Whitworth, Crane Bros., McOnie & Co., and other well-known makers, including a number of American products.

Power for this part of the work is supplied by a large horizontal h. p. expansive engine, idle in an enginehouse immediately adjoining a large double-cylinder engine of about the same power ready to be put in operation at once should the necessity arise, it being the principle of the company to take all reasonable precautions to prevent stoppage of the works in the event of a breakdown.

Foundry and other Shops.—Passing now through a small auxiliary machineshop containing a number of lathes, wheel-cutting, milling and other machines, which, owing to increase of business, it has been found necessary to put into operation, the foundry is encountered. This building, before its transfer to the present company, was used as a shot and shell factory, evidence of its former activity in the shape of huge projectiles of every caliber being met with all over the extensive premises. The foundry is equipped with three 2-ton cupolas, and a large new cupola, with drop bottom and the latest improvements and capable of melting eight tons of metal per hour, is now nearly completed. The foundry is served by a large 15-ton jib crane, a 3-ton and several smaller cranes. Immediately under the 15-ton crane is a large iron circular casting pit, capable of casting propellers up to 18′ diameter

The brass foundry contains three ordinary and one Carr's patent crucible furnace, and a great variety of iron and brass castings ranging from a few ounces to many tons in weight are being constantly turned out.

Adjoining the foundry is the pattern shop and in close proximity is the smithy. This latter shop contains a large steam hammer, served by two 4-ton jib cranes and capable of welding propeller shafts up to 14″ diameter. A somewhat smaller hammer is provided for ordinary work, and both are in constant use, the smithy in works of this kind being generally a very busy shop indeed. The coppersmith shop adjoins the smithy and seems also to be a very busy adjunct, but otherwise calling for no special comment.

Rails are laid from the dock and wharves into the various shops for the expeditious handling of heavy pieces of machinery, while an efficient water service, supplied with the water from the adjacent Chinese Inland Waterworks, with numerous hydrants all over the works, testifies to the care and thoughtfulness of the management

Magnitude of the Marine Work.—Before closing this article and to give some idea to those whom it may concern of the capabilities of these works and the magnitude of the contracts they are prepared to undertake, it might be mentioned that several months ago the steamer *Kiangfoo*, a large paddle steamer belonging to the China Merchants' Steam Navigation Company running on the Yangtsze River, met with an accident and completely wrecked her engine, which was of the walking-beam type. The repairs were entrusted to the Kiangnan Dock and Engineering Works. The steamer came alongside the company's wharf, under the sheerlegs, and work was immediately commenced by lifting out the broken engine beam, broken cylinder, cylinder cover and piston with its pistonrod badly bent. A new cylinder, 13′ long by 76″ diameter and weighing 16 tons was successfully moulded and cast; also a new skeleton for the walking beam and a new cylinder cover. A new iron diamond frame for the walking beam was forged in the smithy, machined, heated and stuck on to the skeleton. The holes for the end and center pins were accurately bored out and the huge pins fitted and shrunk in and tightly and efficiently keyed up, the whole beam in its finished state weighing nearly 11 tons. The pistonrod was drawn from the piston after some difficulty, straightened, turned and refitted, and the piston fitted with new rings. Finally the whole of this heavy machinery was lifted on board the ship, the cylinder jointed, the great beam lifted into its bearings on the top of the gallows frame, and the engine connected up, the whole job occupying a little over three months and forming altogether the largest job of its kind ever undertaken in the Far East. The steamer ran her trial trip immediately the job was completed to the satisfaction of every one concerned, and has been running with great success ever since. This work, undertaken at a time when the company may be said to have scarcely started business, when the shops were in a state of transition and order was being evolved out of chaos, so to speak, and with a large quantity of other work on hand, reflects the greatest credit on the management and the able staff at its command.

Since the opening of the dock on December 2d, 1905, it has been occupied continuously, the total tonnage docked to the end of November, 1906, being upwards of 153,500 tons

## TOKYO INDUSTRIAL EXHIBITION

An industrial exhibition will be held at Uyeno Park, Tokyo, from March 20th to June 20th, inclusive. The *Hakuran-kwai-Kyosan-kwai* (Exhibition Auxiliary Association) has been recently organized, with the object of affording an especially cordial welcome to visitors from abroad, and to assist them in viewing the far-famed scenery of Japan and in enjoying the sights which travel in the interior of Japan may bring to their notice. The exhibition will be open during the most delightful season of the year, making journeys into the country most enjoyable. Every convenience will be prepared for visitors to enable them to spend their time and money to the best advantage. The President of the Exhibition Auxiliary Association is Baron Takatomi Senge; Mr. Yukio Ozaki is First Vice-president and Mr. Buyei Nakano Second Vice-president.



WEST WHARF, SHOWING 60-TON STEAM-DRIVEN SHEER

TWO STEAMERS IN THE DOCK FOR REPAIRS

## HERMANN KRUSI, C. E.

Hermann Krusi is dean of the American civil engineering contingent in the Philippine Islands. Besides being one of the best-known members of his profession in the United States, his reputation has followed him to the Orient where he is everywhere regarded with the highest esteem, not only on account of his great ability as an engineer but because of his modest yet thorough manner of doing business.

Mr. Krusi has been a leading spirit in his profession in America for many years. Born in Worcester, Mass., in 1858, he spent the most of his boyhood days in Oswego, N. Y. He was graduated from the classical course of the Oswego Normal School in 1878, and from Cornell University with the degree of C. E. in 1882. Shortly after leaving college he went to the Pacific Coast to follow his profession, and from 1884 to 1900, inclusive, he held the position of Chief Engineer of the San Francisco Bridge Company. In this capacity he designed and constructed a large number of railroad and highway bridges on the Pacific Coast, many of them of great magnitude and with large spans and high piers.

When the Atlantic, Gulf and Pacific Company was organized Mr. Krusi was chosen its First Vice-President, which office he has held continuously since its foundation. After the death of President George W. Catt, the directors offered the presidency of the company to Mr. Krusi, but he declined the honor preferring to retain his present status where he believed he could be of greater service to the corporation.

The Atlantic, Gulf and Pacific Company went into hydraulic dredging while the business was in its infancy and today is the largest hydraulic dredging concern in the world. With others Mr. Krusi designed and patented a special excavator for the Colusa Irrigation Canal, in California, and following close upon this successful departure in dredging methods came the beginning of construction by the company of twenty hydraulic dredges, of which number it owns and operates thirteen at the present time. In average material the company's plant has an easy annual capacity of 30,000,000 cubic yards, and to fully appreciate how much 30,000,000 cubic yards *per annum* means, one needs only refer to the specifications of the Panama Canal, from which it will be seen that the total dredging in connection with that gigantic engineering undertaking, including the harbors of Colon and Panama, is only 26,000,000 cubic yards. The total material handled by the company, or now under contract, aggregates more than 100,000,000 cubic yards, of which approximately one half has been done for the Federal and Insular Government, and the other half for railroads and other private interests in the United States. The Atlantic, Gulf and Pacific Company does not confine its field strictly to dredging, but includes general civil engineering and contracting for excavation and reclamation, and construction work of every description. The head office of the company is in New York City, in addition to which it has branches in San Francisco, Manila, Seattle, Los Angeles, Vancouver (B. C.), and Panama.

These few facts about the magnitude of the Atlantic, Gulf and Pacific Company are only cited to indicate what an important part Mr. Krusi must have taken in building up its present particular and wide field of engineering. When the company decided to establish its Manila office, Mr. Krusi was selected to come out and assume the general management of the business. With his customary aggressiveness he soon made this Oriental branch one of the most important in the company's business organization. He has constructed the new harbor-works of Manila, containing about 7,000,000 cubic yards of dredging and 1,000,000 tons of rockwork, besides concrete and masonry work in large quantities. He also constructed the Marine Railway at Engineer Island, the new Ayala Bridge, the Protestant Episcopal Cathedral Church of St. Mary and St. John, the Pasig River walls, and much other important work the enumeration of which would be useless for the purposes of this sketch. He is now building two sections of the new Manila gravity water supply, *viz*, the pipe line about 11 miles long, and the tunnel and viaduct, the former ¾ and the latter 1½ miles long. He is also building the new Manila sewer system, a work of large magnitude, including 6,000′ of 42″ submerged castiron outfall into Manila Bay, 40 miles of vitrified pipe sewers and 7½ miles of concrete sewer.

Unde the supervision of Mr. Krusi, the Atlantic, Gulf and Pacific Company has just completed a large and splendidly-equipped structural-steel and bridge works at the confluence of the Pasig and San Juan Rivers. In this shop will be constructed the magnificent double-track drawbridge across the Pasig River, at Pandacan, for the Manila Railroad Company. This bridge was designed complete—both sub- and superstructure—by the Atlantic, Gulf and Pacific Company at Manila, under Mr. Krusi's personal direction.

The new tanks for Fort McKinley will also be constructed at these shops, as well as the waterworks pipe line for the City of Manila and the piers for the new steel and concrete wharves at Manila, now under contract with the Philippine Government, these contracts being taken for the Atlantic, Gulf and Pacific Company by Mr. Krusi.

Probably one of the most important features of Mr. Krusi's engineering career in the Orient is his successful solution of the problem of Filipino labor. He was the first American to obtain satisfactory results with this labor and to employ the natives satisfactorily in every class of work required.

## THE HONGKONG AND SHANGHAI BANKING CORPORATION

Following is the 83d report of the Court of Directors of the Hongkong and Shanghai Banking Corporation to the shareholders at their ordinary half-yearly general meeting, which was held in the City Hall, Hongkong, February 18th, at noon:—

GENTLEMEN:—The directors have now to submit to you a general statement of the affairs of the bank, and Balance Sheet for the half-year ended December 31st, 1906.

The net profits for that period, including $1,712,472.37, balance brought forward from last account, after paying all charges, deducting interest paid and due, and making provision for bad and doubtful accounts, amount to $4,433,102.68. The directors recommend the transfer of $750,000 from the Profit and Loss Account to credit of the Silver Reserve Fund, which fund will then stand at $11,000,000. After making this transfer,. and deducting Remuneration to Directors, there remains for appropriation $3,668,102.68, out of which the directors recommend the payment of a dividend of £1 15s. per share, which at 4/6 will absorb $622,222.22, and a bonus of £1 per share, which at 4/6 will absorb $355,555.55. The difference in exchange between 4/6, the rate at which the dividend and bonus are declared, and 2/3½, the rate of the day, amounts to $968,786.01. The balance $1,721,558.00, to be carried to new Profit and Loss Account.

*New Capital.*—After careful consideration, your directors have decided that it is desirable to further increase the capital of the bank, from $10,000,000 to $15,000,000. A circular will be issued to shareholders shortly, and later an extraordinary meeting of shareholders will be called to obtain your sanction to the scheme being carried out, when your directors will recommend the creation of 40,000 new shares of $125 each, to be issued to shareholders at the price of £30 each, payable at current rate of exchange, in the proportion of one new share to two old shares.

*Directors.*—Mr. G. H. Medhurst has been elected Chairman for the year 1907, and the Hon. Mr. W. J. Gresson Deputy Chairman. Mr. H. A. W. Slade, having resigned his seat on leaving the Colony, Mr. G. Balloch has been invited to fill the vacancy. The appointment requires confirmation at this meeting. Mr. A. Haupt, Mr. R. Shewan, and Mr. A. J. Raymond retire in rotation, but being eligible for reelection, offer themselves accordingly.

*Auditors.*—The accounts have been audited by Mr. W. Hutton Potts and Mr. A. G. Wood, who offer themselves for reelection.—(*Signed*) A. HAUPT, *Chairman*.

The report of the directors was concurred in by the shareholders and the elections resulted as therein recommended.

Asbtract of assets and liabilities of the Hongkong and Shanghai Banking Corporation, December 31st, 1906:—

*Liabilities*

| | | |
|---|---|---|
| Paid-up Capital | | [illegible] |
| Sterling Reserve Fund | | [illegible] |
| Silver Reserve Fund | | [illegible] |
| Marine Insurance Account | | [illegible] |
| Notes in Circulation:— | | |
| Authorized issue against securities deposited with the Crown Agents for the [illegible] | $10,000,000.00 | |
| authorized by Hongkong Ordinance No. 19 of 1900, against coins lodged with the Hongkong Govt. | 6,075,825.00 | 16,075,825.00 |
| Current accounts:— | | |
| Silver | $68,932,875.80 | |
| Gold, £4,131,638 11s. 2d. = | 36,089,096.66 | |
| Fixed deposits:— | | |
| Silver | $49,329,279.33 | |
| Gold, £5,138,163 5s. 1d. = | 44,858,630.53 | |
| Bills Payable (including Drafts on London Bankers, call loans and short sight drawings on London office against bills receivable and bulli on shipments) | | 13,878,966.2 |
| Profit and loss account | | 4,433,102.68 |
| Liability on Bills of Exchange rediscounted £6,162,364 8s. 10d. of which £4,035,759 8s. 9d. have since run off. | | |
| | | $264,097,776.28 |

*Assets*

| | | |
|---|---|---|
| Cash | | $39,896,108.72 |
| Coin lodged with the Hongkong Government against note circulation in excess of $10,000,000 | | 10,000,000.00 |
| Bullion in hand and in transit | | 2,047,016.00 |
| Indian Government rupee paper | | 2,038,021.12 |
| Consols, colonial and other securities | | 6,598,016.72 |
| Sterling reserve fund investments, viz:— | | |
| £598,00 2½% consols at 82 | £ 490,360 | |
| (of which £250,000 lodged with the Bank of England as a Special London Reserve.) | | |
| £255,000 2½% National war loan, at 90 | 229,500 | |
| £325,000 other sterling securities, written down to | 280,140 | |
| | £1,000,000 | 10,000,000.00 |
| Bills discounted, loans and credits | | 93,039,746.20 |
| Bills receivable | | 99,034,593.40 |
| Bank premises | | 1,444,274.02 |
| | | $264,097,776.28 |

General Profit and Loss Account, Hongkong and Shanghai Banking Corporation, December 31st, 1906:—

*Dr.*

| | | |
|---|---|---|
| To Amounts written off:— | | |
| Remuneration to directors | | $ 15,000.00 |
| To Dividend account:— | | |
| £1.15. per share on 80,000 shares = £140,000 at 4s 6d | | 622,222.22 |
| Bonus of £1 per share on 80,000 shares = £80,000 at 4s 6d | | 355,555.55 |
| | | 977,777.77 |
| To Dividend adjustment a/c:— | | |
| Difference in exchange between 4s.6d. the rate at which the dividend is declared, and 2s.3½d the rate of the day | | 968,766.01 |
| To Transfer to silver reserve fund | | 750,000.00 |
| To Balance forward to next half-year | | 1,721,558.00 |
| | | $ 4,433,102.68 |

*Cr.*

| | | |
|---|---|---|
| By Balance of Undivided Profits, 31st Dec- | $ 1,712,172.37 | |
| its for the Six Months ending 31st December, 1906, after maki | | |
| ducting all Expenses and Interest paid and | | |
| | | $ 4,433,102.68 |

*Sterling Reserve Fund*

| | |
|---|---|
| [illegible] | [illegible] |
| | $10,000,000.00 |
| *Silver Reserve Fund* | |
| To Balance | $11,000,000.00 |
| | $11,000,000.00 |
| By Balance 30th June, 1906 | $10,250,000.00 |
| By Transfer from Profit and Loss Account | 750,000.00 |
| | $11,000,000.00 |

## ANHUI RAILWAY

"Quietly and unostentatiously," says *Nan Fang Pao*, a well-informed Chinese newspaper, and characterized by strict business methods, "the Anhui Railway has been doing its work. With Lord Li Ching-fang as Director-General of the enterprise, assisted by a staff of men who know their business, the success of the railway is a foregone conclusion. Already the survey of the line has been completed to Ningkwofu, distant about 50 miles from Wuhu, and the engineers are now hard at work surveying the third section from Ningkwofu to Kuangtechou. The work of surveying has been greatly delayed owing to heavy rains.

"The land-purchasing officials have been busy in buying the land required for the railway, and they have made excellent progress in their work. No serious interference with graves or important buildings has been met with, and the difficulty of settling disputes and lawsuits with land grabbers and speculators has been conspicuous by its absence; as the people of Anhui appreciate the value of the iron road to their province and will not voluntarily place obstacles in the way. Already many of them, seeing the foreign engineers and their assistants hard at work in locating and surveying the line, have recognized the fact that the railway is a reality and will in the course of two or three years become a most valuable asset for promoting the commercial and material prosperity of their province. They have, therefore, shown considerable willingness to come forward to subscribe for the shares, and their former indifferent attitude toward the enterprise is gradually undergoing a change.

"The directors and the gentry, although fully alive to the present spirit of *China vs. the Chinese*, fear no complications or other consequences from the employment of foreigners, and have engaged several Norwegian and one Japanese engineer for the construction of their line. These foreign gentlemen have got on excellently with the Chinese in Anhui, and their relations with the directors and gentry are of the most cordial nature. There is absolutely no such thing as anti-foreign spirit observable in Anhui, so far as the experience of these foreigners goes. This proves conclusively the wisdom and sensible policy of the Director-General in daring to take a policy opposite to that of the directors of other provincial railways who insist on employing only Chinese engineers of fabulous salaries, far out of proportion to their ability and experience. Owing to the sensible policy of Lord Li, the Anhui Railway will prove a most economical undertaking and will serve as an example for other provinces to imitate. As soon as the railway materials, such as bridge-girders, sleepers, etc., arrive next spring, the work of laying down the line and erecting bridges will commence. The work of digging in the ground at the railway terminus for building workshops, warehouses and stations was commenced several months ago, and already considerable progress has been made. The report that the Anhui Railway has all of funds is hardly correct, as a large portion of the required capital, Tls. 4,000,000, has already been subscribed, while the extra likin imposed on rice and salt exported from Anhui Province is yielding a substantial income yearly.

"Altogether, the prospect of the Anhui Railway is very bright, certainly far more so than many of the enterprises in the neighboring provinces."

## PRECIOUS STONES IN SIAM

According to the *Siam Free-Press*, sapphires and rubies are the only gems the working of which is of any importance, in Siam, though spinels, zircons, garnets, and topaz are also produced to a small extent. Of the two forms of corundum, sapphires are very much more abundant and more largely worked than rubies. Siamese sapphires form a considerable proportion of the world's supply of this gem. Statistics, however, are not available, as there is no duty on the stones, and the work is carried on by numerous small parties of men and even by individuals, who dispose of their findings to a number of travelling traders.

Siamese rubies do not command a good price, as those of good color are mostly very small, while those of good size are of poor color. It is believed that any good stones which are found are sent overland to Burma and sold as Burmese rubies. As regards statistics, the same remarks apply as have already been made about sapphires.

Practically all Siamese sapphires come from the District of Phailin, in Battambong. Rubies are worked in a small way in this district, but the chief ruby workings are in Chantaboon and Kratt. The deposits are all alluvial, work being usually carried on by digging numerous small pits in the neighborhood of streams, the gem-bearing earth being washed by hand in the streams. Most of the work is in the hands of Burmese and Shans, who, however, employ a considerable number of Laos as laborers.

The gem-buyers are Burmese, Shans, Singalese, and natives of British India, and some European firms in Bangkok take a share in the trade.

The gem-mining districts are, for the most part, exceedingly unhealthy, which fact is a great bar to European enterprise in this line.

## RAILWAYS IN MANCHURIA

The British Commissioner of Customs recently sent to Fengtien to take charge of the establishment of Custom Houses at Mukden and Antunghsien, has presented a memorial, according to the *China Times*, to the Tartar General at Mukden, suggesting the immediate extension of the Imperial Railway of North China from Hsinminfu to Fakumen, which places are about 55 miles apart, to facilitate foreign and native trade in Southern Manchuria. He states that by building this section, merchandise from Peking, Tientsin, and other places inside the Great Wall, can be transported direct to Fakumen for reshipment to Kirin and Heilungkiang, while the products in the District of Liaohsi, west of the Liao River, can be sent to Tientsin, etc., in exchange without trouble. Otherwise all products traffic in the Liaotung and Liaoshi districts will come into the hands of the Japanese who can send them to Japan and other places *via* Tairen. This proposal is favored by the Tartar General, who will soon apply to the proper authority for funds to carry it out. The commissioner also stated that in connection with the reorganization of trade in Manchuria, especially in Fengtien, which is the wealthiest and most important of the three eastern provinces of Manchuria, it is absolutely necessary to effect the following reforms without delay:—

(1) To construct broad roads in important places in Southern Manchuria, such as Mukden, Fakumen, Hsinminfu, T'iehling Paioyang, etc., in foreign style, to facilitate the transport of foreign and Chinese merchandise by carts and other vehicles. After the completion of the broad roads, a Department of Public Works should be established at Mukden, or some other central point, to take charge of them so that they may be repaired or rebuilt from time to time in case of need, under supervision of experienced foreign and Chinese officials. By the construction of these roads, not only will the trade in Fengtien be much improved, but in case of hostilities, the Chinese authorities will find it much easier to transport their military forces.

(2) To dredge the shallow parts in the Liaoho, which is the only inland waterway in the Province of Fengtien suitable for the navigation of steamboats and junks for transporting merchandise, so that steamboats and Chinese cargoboats may navigate it without difficulty. After dredging the river, the Chinese authorities should reduce the river and boat tax as an encouragement to Chinese boatmen; then the convenience of navigation in the Liaoho will become equal to the transport of freight by rail.

(3) As the greater part of the foreign and native merchandise in Fengtien is transported by carts drawn by horses or mules from one place to another, and in view of the heavy charges for horses and mules lately, it is urgently necessary to devise means to encourage Manchurian natives and Mongols who are owners of large herds of these animals, to bring them to Fengtien for trade purposes, otherwise the commerce of Southern Manchuria will be much hindered, because now the charges for horses, etc., are five or six times higher than they should be.

## COAL LOADING, NEW SOUTH WALES

Writing from Newcastle, Mr. F. W. Goding, American Consul, says that experts have recognized for some time that the appliances for loading vessels with coal in that port of Australia were antiquated. As an instance, in England the coal cars with a capacity of 15 tons are so manipulated that 500 tons per hour are loaded at each berth, while in America 2,000 tons per hour is usual. In Newcastle 1,000 tons of coal per hour are loaded at 18 berths, showing how far behind the system is. The engineer in charge has evolved a system of gravitation which will allow vessels to be fed without cessation or interruption until loaded. Under this system 40 or more coal cars, of an average capacity of 7½ tons, will be unloaded at each crane per hour, two cars being handled at the same time. This means that a vessel will be fed at the rate of 640 tons per hour at each crane instead of 80 tons per hour as at present. There is a strong probability that the capacity of the coal cars will be increased to 15 tons in the near future, which would allow the handling of 1,200 tons per hour at each berth, reducing the cost of loading coal at this port by 20 per cent. The Government is determined to bring the system of loading coal at Newcastle up to the highest point of efficiency, in which effort all those having any connection with the commercial interests of the port heartily second.

## MALAY WOMEN AS GOLD MINERS

Under a recent order made by the Resident, the royalty payable on alluvial gold won by persons working under individual mining licenses in the State of Pahang, F. M. S., has been commuted for a fixed payment of $5 a person a year, half rates being paid for six months or less. This alluvial industry—which is confined chiefly to certain villages along the trunk road, such as Budu, Sega, Tanjong Besar, and Benta—is, according to the *Pinang Gazette*, assuming fairly extensive proportions. A feature of the work is that large numbers of Malay women are engaged and are keener on it than the men. They take great pains to wash carefully selected sands for small quantities of gold. The ore so obtained is seldom or ever exported, being either made into rough jewelry or sold to local Chinese instead. Another form of primitive mining, favored by kampong Malays in many parts of the Ulu, is called *meriau* or *melanda*. Like the fossicking for alluvial gold, it consists of washing the sands of selected river beds for tin ore, and here again the women are much in evidence and do more of this kind of work than the men. With a little luck and some perseverance, a fair quantity of ore is usually won in this way, from 50 cents to a dollar's worth being obtained by one worker in a day, which is ample for the average Malay family to live on, and have something over, even if but one person of a household went to *melanda*.

# Physiography of the Island of Cebu, Philippine Archipelago

[*Coal-fields are at present being developed on the Island of Cebú and indications point to practically inexhaustible and valuable returns. Messrs. J. G. White & Co., Inc., engineering contractors for the Philippine Railway Company, are opening up large deposits of good lignite coal at the Caridad mines, for use on the railroads of Panay, Cebú and Negros, now under construction. Mr. D. M. Carman and other promoters are also developing promising deposits, and the analyses of the Compostela coal have been quite satisfactory. Cebú is just now the most promising coal district in the Philippines, so the following condensation of a paper by Mr. Warren D. Smith, Government Geologist, dealing with the physiography of Cebú and published in a recent issue of "The Philippine Journal of Science," should be of interest in view of the fact that one of the greatest economic problems in connection with the promotion of railroads in this part of the Philippines has been the matter of fuel; then, again, a bountiful coal supply, at a reasonable market price will insure industry along the railroad lines.* EDITOR'S NOTE.]



VIEW OF A PORTION OF THE "CORDILLERA" FROM CAMP WALKER; ELEVATION ABOUT 3,000'

The core of the Island of Cebú is largely plutonic rock, in some places felsitic, almost a typical basalt; elsewhere a diorite, and again very much like a granite. This igneous rock is found in all streams cutting any of the three ranges shown in a cross section of the island. A very blue, hard, and extremely fine-grained variety constitutes Mount Maupa, one of the landmarks of Cebú. This mountain with a conical top rises above the range of which it is a part and is very conspicuous from the sea. Locally it is referred to as the *Sugarloaf Mountain*. A porphyritic rock, which is a hornblende-andesite, is seen in the vicinity of Compostela, on the tramroad to the group of mines back in the hills. A conglomerate of varying thickness succeeds above the igneous complex. This conglomerate is always present and seems to be conclusive proof that the igneous rock is not of the nature of an intrusive mass. Were it such, the difficulties of mining might be increased enormously.

Stratigraphically, above the conglomerate comes a series which is very difficult to demarcate and to separate into its integral parts. It comprises alternating beds of shale, sandstone, and limestone, generally unfossiliferous. Above this comes the coal measure proper, consisting of a gray shale at the base, thickness unknown, a black, thick coal occurring in at least two seams, the first averaging 1.5 meters in thickness, although greater thicknesses have been reported; this is followed by a firm, yellowish-gray, seemingly unfossiliferous sandstone; above this lies a second seam of coal varying from 30 centimeters to 76 centimeters. This is of a much inferior grade, being characterized by shale and slate partings. Above this latter seam is a bedded limestone.

In the vicinity of the Guila-Guila property, at the headwaters of the Mananga River, there is a limestone formation which is extremely rich in the genus *Orbitoides* (Lepidocyclina), a further study of which forms may be shown to be *Lepidocyclina insulae-natalis* Jones & Chapman, or closely related to that form from the Miocene of Christmas Island. This limestone appears unquestionably to be upper Miocene, equivalent to the *Gaj of the Sind*, India. At one point, in a cutting on the Danao tramroad about two kilometers below the old mines, limestone probably containing nummulites is found. This limestone appears to be unconformable with and below the orbitoidal beds.

"La CORDILLERA CENTRAL."—The *Cordillera Central* may be said to form the backbone of the Island of Cebú. It extends north and south, corresponding to the long axis of Cebú and also to one of the main tectonic lines of the archipelago. Its greatest elevation does not, in all probability, exceed 1,000 meters. It is partially wooded and almost without inhabitants; the only human beings to be found there are scattered bands of *ladrones*, or *pulajanes*, as they are locally termed, and the *constabularios* who hunt them. Wild and almost inaccessible, underlain by igneous rock which does not support a very flourishing flora, a region of pronounced relief, it is not very enticing even to the geologist, and the native avoids it as he would the plague (see illustration showing a portion of the *Cordillera* country).

Although the total elevation, for a mountainous country is not great, the relief of Central Cebú is exceedingly pronounced. There are two reasons for this: the first and chief one being the short, horizontal distance to sea level, which enhances the declivity, and the second, the scarcity of vegetation. These conditions are favorable for the development of steep profiles and V-shaped cross sections in the streams. Nevertheless, outcrops are few and the talus is very heavy on most of the valley walls. In some isolated portions there is still a capping of coralline limestone which gives a more or less even crest to the range, but where this is absent, as in the region of Mount Maupa about 30 kilometers southwest of the City Cebú, the outline is serrated.

The main folding in the island has taken place in an east-west direction, so that the axis of the folding runs north and south. The effect of this is to give the streams in the vicinity of the *Cordillera* a north and south direction. At their sources they may be east and west and the same may be true farther down, when they turn again to cut at right angles through the foothills. There is a minor cross-fold north and south which somewhat modifies the arrangement of the drainage and which also causes the frequent sags in the high line of the central portions and the complete dying out of the ridge to the north.

INTERMEDIATE UPLANDS.—The intermediate uplands include all the elevated region between the *Cordillera* and the costal plains. The surface rock is for the most part either limestone or marl, in some places sandstone or a coral sand formation. The geological events which have transpired to bring about the resulting features of this upland country are many and have been quite complex. In the first place the older sedimentaries were profoundly folded and probably also much faulted; in the second erosion set in and truncated many of the folded beds; in the third, subsidence occurred and a coralline mantle was laid down upon these truncated folds, and in the fourth, the whole region received a thrust from below which elevation took place, but it was an unequal elevation, with tiltings east, west, north and south. The north and south tilt, which however, may be decidedly more recent than the east and west one, is best seen in the vicinity of Argao, where the marine terraces incline

the north at an angle of about five degrees. The even sky-line of the central part of the island no doubt results from the peculiar growth of coral reefs, which grow up to a limiting plane, the surface of the water, and the coralline mantle has suffered but little tilting in the region of the *Cordillera*. In the lower regions the even sky-line is still well preserved in many places, but the tilting is marked.

Mr. Bailey Willis's brief discussion of his physiographic studies in Europe, appearing in the *Fourth Year Book* (Carnegie Institute, 1905), suggests possible explanations for some of these phenomena, and the Carpathian type of mountains, with their peculiar physiography, namely, folded Neocene strata subsequently tilted and warped with sink holes, seems to find an analogy in Cebú. Mr. Willis also emphasizes the fact that the *growth* of mountains is distinct from the existence of mountains by virtue of this structure, while on the other hand it appears that those of Cebu have *grown* rather than that they are due to inherent structure, for were it not for the great subsequent erosion, one might start from the coast and climb toward the *Cordillera* without being aware of anything more than a moderate ascent, for is is the after work of the streams which hat made Cebú appear to be mountainous. The illustration showing the dissected upland country in the region of the Compostela coal-fields shows what this work has been; indeed, the similarity of this region with the Benguet country of Northern Luzon is quite marked, although in reality its elevation is from 2,000 to 3,000′ less.

Extended sections are rare, but one in Butuanon Creek was photographed, showing the local warping in the Pliocene limestone (see illustration of warped limestone in Butuanon Creek).

Hanging Valleys.—The phenomenon of hanging valleys is not by any means common in Cebú, but there are two or three quite remarkable examples. One is found on the west coast, in the vicinity of Barili, where there is a beautiful waterfall of about 50 meters, and another, much more typical, in the Guila-Guila country where the Bocanit drops off the upland country into the valley of the Mananga, about 250′ below. The outcrop near the top of the wall is a limestone, very rich in *Orbitoides*. The underlying rock is igneous; although the higher valley is still young, there is a marked difference between the cross sections of the two, the upper one being more on the following order:—

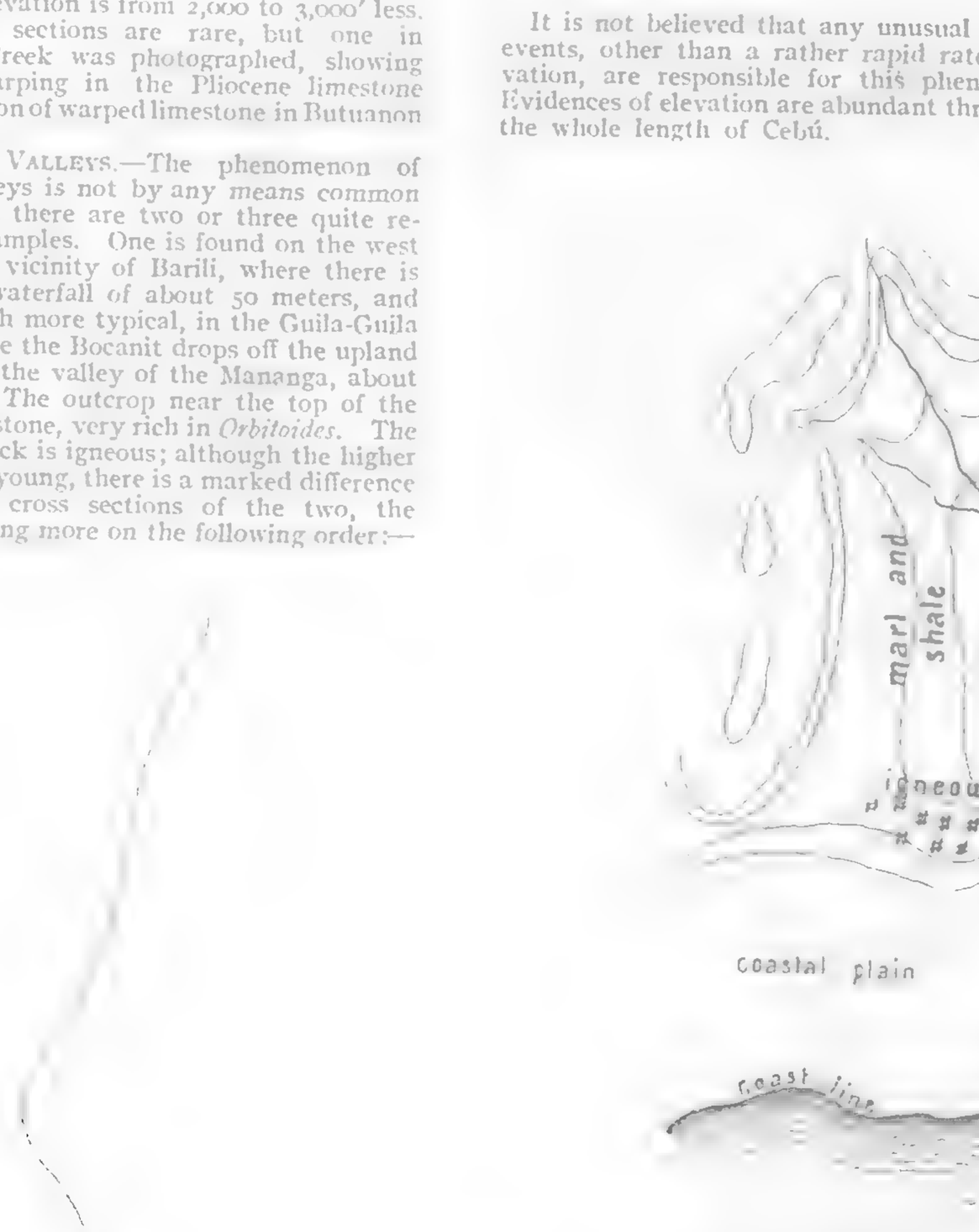



DIAGRAM OF VALLEYS ON ISLAND OF CEBU

The lower one is a typical cañon, and is diagramatically sketched as follows:—



It is not believed that any unusual series of events, other than a rather rapid rate of elevation, are responsible for this phenomenon. Evidences of elevation are abundant throughout the whole length of Cebú.

formations, besides gathering the contributions from the higher stream itself.

An accompanying illustration shows the cañon-like appearance of the Mananga just below the point where the Bocanit enters, and also the men at work constructing the new Cebú-Toledo Road and the difficult nature of this work. In the Philippines it is absolutely imperative that the roads should be built well above the highest water of these mountain streams and also high enough so that the rock on the upper slopes shall be reduced to a minimum.

The uplands of Cebú do not support as large a population as one would suppose to be the case in many portions, chiefly in the center ones; the natives live huddled in squalid barrios or reconcentration camps. Corn is the principal product, but even this crop is cultivated in a sporadic, half-hearted, and primitive way, nature being relied on to do the larger part of the work. An accompanying illustration gives a view of typical upland country in the region of the Compostela-Carmen coal-fields.

Coves.—The best land on the island of Cebú is to be found in the valleys of such streams as the Pandan, Jacupan, Carmen, etc. These meander through beautiful, broad, flat-bottomed valleys, the level of the valley floor being usually not over 50 meters above the sea; they are often roughly circular in outline, and in nearly every case the stream which occupies the valley issues from it through a narrow cañon-like cut in an igneous formation which acts as a barrier. The accompanying diagram will probably convey a better idea of the relations pertaining to these valleys. The process of formation is analogous to that of a mill pond in a stream. Instead of there being a damming up of water, there is a ponding, as it were, of silt and degradational material brought down by the stream, and so a local flood plain is formed. In these coves the streams have every appearance of old age, with meanders especially well developed. There are flood plains, but not flood plains usually thought of—that is, the ones produced by material deposited during times of overflow. They are formed largely as a result of *lateral planation*. The importance to agriculture of this process whereby a stream works back and

Another factor might be suggested as having played some part in producing the great difference in these two valleys, namely, the quantity of water available for the work of erosion on the plateau and in the deeper valley. The country rock underlying the highlands is limestone, abounding in sinks and cracks, so that meteoric waters do not gather so well into streams and hence do not become available for degradational work. On the other hand, the lower stream taps all or at least a large part of the underground water from the overlying



DISSECTED UPLAND COUNTRY IN THE REGION OF THE COMPOSTELA COAL-FIELDS

forth over a tract of land, can not be over estimated. In these coves all the contours are gentle and rounded, save at the lower ends, where the streams usually issue through picturesque gorges. Just as the scenery of the *Cordillera* is wild, rugged and forbidding, so here is it mild, domestic, and inviting (see illustration of the Carmen Valley)

COSTAL PLAINS.—Cebú, throughout the most of its extent, has remarkably little costal plain, and yet it is this exceedingly narrow and interrupted strip which supports her proportionately enormous population. It has a foundation of coral reef on which has been deposited the débris of the hills, Piedmont River deposits. In this débris is material from the decay of all manner of rocks—diorite, andesite, basalt, sandstone, and limestone—through and over which the streams have worked their way from the highlands to the lowlands. The gathering together of all these constituents in the plain soils has rendered them very rich, as they consist of many varieties of elements. This raised shelf is, likewise, a result of manifold processes of building. With a foundation of coral rock, these plains have been constructed by deltas, alluvial fans of the rivers coming down from the mountains, and by the work of the sea, as is manifested by bars and spits. Undoubtedly much of the planeness of this lower country has been produced by wave cutting. This plain has not a perfectly even and uniform surface, because all these different agencies have left on the topography their mark which time has not entirely obliterated.

To make a critical study of the costal plain its mode or modes of origin must be reviewed. As islands in regions of volcanic disturbance, as in the case in the Philippines, emerge from the sea, usually with little or no costal plain, a hypothetical case may be resorted to to show the nominal course of development of such a plain.

It is shown by the survey that while there is a shifting of material from the highlands to the sea-border, there is no diminution in the bulk of the mass, but only a change in the form. It is also shown that the portion between the levels of high and low water approaches more nearly a true plain, for along this belt the waves, tidal or otherwise, are continuously at work leveling down any irregularities. Beginning from here, in either direction, towards the shore or towards the sea, the profile departs greatly from the horizontal. If the island were gradually to subside, the water would encroach on the land and the waves would tend to plane off the latter, carrying the horizontality of the profile curve farther and farther inland. If, on the other hand, the island was rising, the plain would grow seaward and there would be little change in the upper portion of the profile. If reefs were forming around the island, which is rising at the same time, the growth of this platform seaward would be greatly quickened. Coral reefs make ideal foundations upon which to build a plain, because they grow up to a limiting level, namely, the surface of the water. When the coast becomes sufficiently elevated to bring these reefs above the water already there is a flat surface which, usually has a very slight slope towards deep water



WARPED LIMESTONE IN BUTUANON CREEK



HANGING VALLEY OF THE BOCANIT VIEWED FROM ACROSS THE MANANGA CAÑON

he edge of this coral platform, the slope is sudden and very great, though just at the the reef is slightly higher, the result of action, no doubt. For the most part the plain of Cebú is of this origin. This is seen by an examination of the plain north City of Cebú, just west of Mabolo, and neighborhood of Mandaue.

rs build many parts of typical costal in the form of delta deposits. The best of this class of formation which Cebú is probably the one of Argao. A delta may be distinguished sometimes by its ular shape and always by its peculiar ction in which two series of beds can be In a lower portion of a section of sufficient layers are seen to dipat rather high angles, s above these lines is a series which is more horizontal, or to be exact, which has the gradient as the stream itself. The s, as elevation continues, will be engorged r old delta, while they build new ones out to sea.

GA RIVER.—The Mananga is typical n example, will be discussed separately. l, physiographic study of this river 's source in the *Cordillera* to the sea, is structive. It is selected because it is ched from the City of Cebú, and it nearly all the features of interest per- the other streams of the island.

it rises in the *Cordillera* the declivity naximum, and therefore the numerous tributaries are short, comparatively straight, and join the main stream at right angles. The latter is oriented north and south because it follows the syncline in the limestone. In this part of its course it is a structural stream. Its valley is broad and shallow, in striking contrast to the conditions of its lower course.

At the boundary between the older limestone and the igneous formation, the stream swings sharply to the east and makes its tortuous way across to the younger limestone. In traversing the igneous formation it flows at the bottom of a deep and narrow cañon, winding back and forth to avoid the harder phases of the volcanic rock, which within short limits varies greatly in physical and chemical composition. In this portion of its course the Mananga would be called an antecedent stream—that is to say, it keeps the general direction it had when it was on the limestone which overlies the igneous rock. In the former part of its course it was a *consequent* stream, flowing to the east as a *consequence* of the slope of the formations. Having become well intrenched, it worked down to the basement rock or became superimposed upon it, without having its general direction changed.

When the Mananga finally leaves the igneous rock it again becomes a *consequent* stream. In this lower portion its valley once more widens to a very broad, fertile, cove-like area, the Valley of Jacupan. A local change in the character of the limestone formation, which being largely coral sand becomes very soft, and the occurrence of marl deposits account for this.

Still farther down is the gravel and sand plain near the sea, where the once vigorous and eroding stream is sluggish as it passes across old, dead, coral shelves finally to dip into the Mactan Sea. In no portion is the Mananga navigable even for bancas. In fact, this lack of depth is true of all the streams of the island, the condition principally being due to lack of sufficient feeding ground to support large streams, to limited plain country, and to the character of the rocks. The lack of certain classes of vegetation offers an added factor. The absence of even one good, navigable stream connecting the coast with the interior produces a profound difference in the economy of the people.

ECONOMIC RELATIONS.—As has been mentioned above, the *Cordillera* region is an undesirable abode for human beings. It affords little in the way of sustenance, its esthetical influence passes over the heads of hungry and hunted beings, the very streams seem to leave it in haste, and the luxurious vegetation of the lower country does not aspire to it. The *molave* and *narra* are prominent among the trees. Neither do the uplands support the life expected of them. Here the physiography is not so much against the existence of human beings as is the geology. The underlying rock in the uplands of Cebú is largely limestone, as is the case in the other region cited, but the lime of these rocks does not remain to form a constituent of the soil. It is readily soluble and passes down the streams to be deposited on the lowlands as travertine and other deposits, or eventually to reach the sea.

Very little rice is grown in these bottom lands, because of one important feature of the soil. One might argue that the reason is not a physical one, but is purely arbitrary because the *hacendero* prefers sugar and corn to rice, but when it is remembered that rice is really more needed in these Islands than sugar or corn, and that thousands of piculs are imported every year to supply the deficiency, it will be seen that there must be another cause for this lack. This is found in the fact that rice needs an impervious substratum to hold the water with which the paddies must be flooded, and this is almost entirely lacking in the valley areas of Cebú.

Although Cebú is the largest hemp depot south of Manila, comparatively little abacá comes from this island. A recent investigation has shown that potash is a large and important constituent in the fiber and juice of the abacá, more being contained in the juice and fiber than in the waste, and as we find the potash content to be high among the mineral values of this plant, we may argue that it requires such a high amount as a requisite for its growth. A fairly exhaustive search over the island and a microscopical examination of a large number of the rocks from Cebú have shown them to be remarkably deficient in potash-bearing minerals. On the other hand, it can be demonstrated that the rocks from the well-known abacá districts are of a class which contain a considerable percentage of potash. It is not for a moment contended that other factors, such as drainage, humidity, etc., do not have much to do with this question.

Almost nine-tenths of Cebú's great population is to be found on the alluvial plain, and here the chief products are rice and coconuts. The soil in this situation is admirably adapted to rice culture, as the stiff paddy clay holds the water around the roots of the plants, but, nevertheless, this crop is not as extensively grown as it might be. The coconut flourishes along the littoral.

Cebú, from the time of the landing of Magellan, nearly 400 years ago, has been a land of trouble. That the human factor, the native and also the European, has played a part in fostering these conditions can not be gainsaid, but there are far deeper causes, which are material, physiographic, and geologic, matters of environment, peculiar to islands and especially peculiar to Cebú, which have played their part. These causes are as follows, especial stress being laid on the order in which they are given:—(1)



MANANGA CAÑON, SHOWING WORKING PARTY ON THE NEW TOLEDO-CEBÚ ROAD

Tropical climate, (2) great population, (3) island habitat, (4) mountainous interior with narrow and interrupted coastal plain.

It has been pointed out that the *Cordillera* is unfavorable as an abode for man; that the uplands, to support a population, require strenuous and improved agricultural methods; the coves are in the hands of a few. Owing to the physiography, therefore, the native must live at the coast, or, in other words, he is not encouraged to leave the sea and to go very far into the interior to take up agricultural pursuits

An accompanying cut shows a portion of the coastal plain with the mountains rising abruptly back of it. The city in the foreground is Cebú

It is a well-known fact that the more primitive a people the smaller is the number which can find subsistence on a given area. For instance, the little Kingdom of Saxony can support an enormous proportion per square mile, but many factors, such as division of labor, the great number of vocations in life which spring with an advanced civilization, the facilities for bringing in food stuffs from the outside, etc.,

make this possible. In more or less primitiv communities, each individual requires a larg range, to borrow a biological term, because ea one procures his or her own daily subsistence This oftentimes necessitates miles of roamin on sea and land. Just as this fact has led to conflicts in the past, and still causes them in the lower animals, so it will today in the highe communities. Example after example might be given where whole groups have become extinct because of these factors, but one will be sufficient. In Jurassic times in North America



ANOTHER VIEW OF THE UPLAND COUNTRY WITH MOUNT MANGILAO IN THE BACKGROUND



FERTILE CARMEN VALLEY LOOKING EAST; NOTE THE MANTLE OF CORAL LIMESTONE ON THE DISTANT HILLS

— lived the great and strange group of
nimals known as the Dinosaurs—these were
—ach prodigious proportions and required
—h extensive ranging grounds (they were
th herbivorous and carnivorous) that they
ame a menace to themselves. They disap
ared because of their very unwieldiness, their
— strength and power finally working toward
ir downfall.

te trouble in Cebú is largely economic, and
result of material causes. Physical factors
is have been outlined are deep seated and
— been at work before governments and
human laws were instituted. Naturally, the solution of the problems presented in this island lies in the reduction of the individual range, in division of labor, in putting into motion the host of units, human and material, now unorganized and idle. There is no danger, as it was once thought, that the community of interests, the introduction of machinery, etc., will cause some to be pushed to the wall in the economic struggle

With these will come new vocations, not known before, and they will be largely industrial, thus leading the native out into ever-widening circles of experience and larger and larger spheres of influence.

To accomplish these things it will not be necessary for him to leave his natural home, but he must study the things about him—the topography of his country, that he may control economic conditions; the streams, with a view to utilizing their water power; the strata of the earth, to mine from them mineral wealth; the soil, that he may get the most from his crops.

With economic conditions in a settled state, and that means a healthy state—the social and political phases will settle themselves

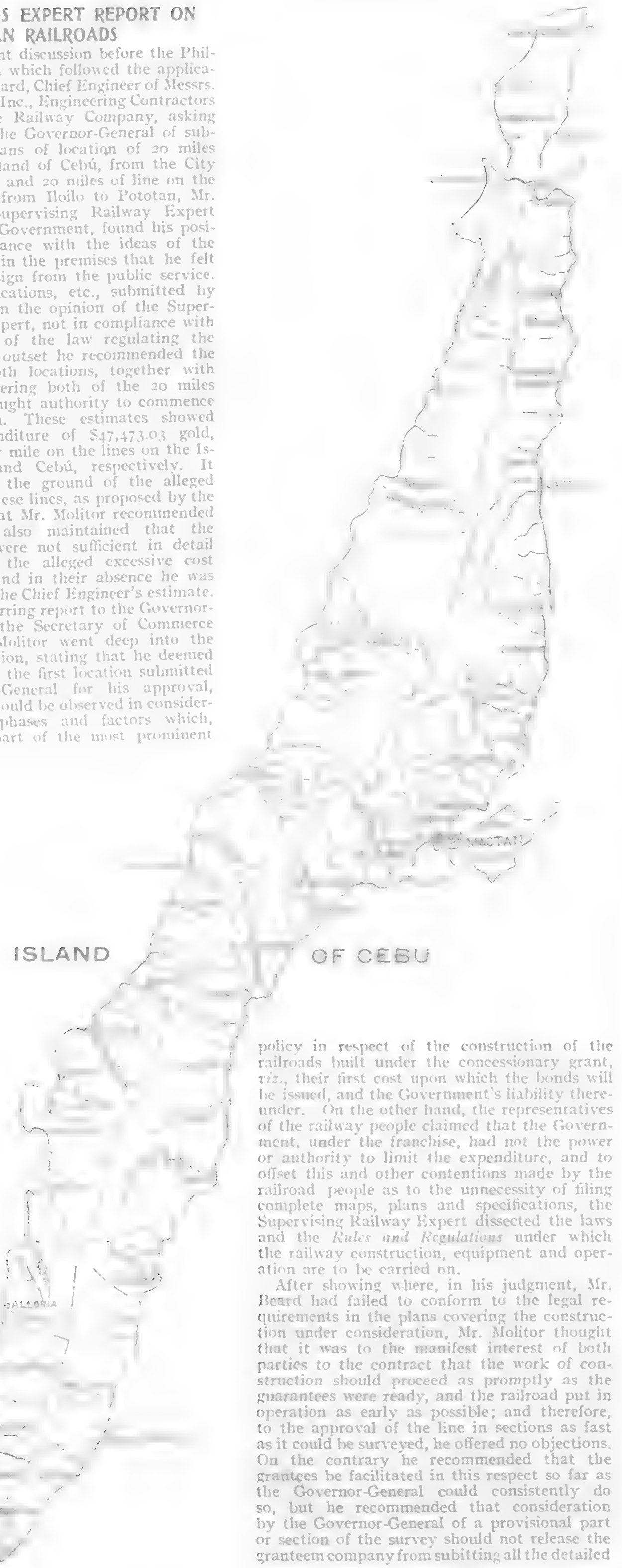


PORT OF CEBÚ, SHOWING TOPOGRAPHY OF THE COUNTRY INMEDIATELY BACK OF THE CITY

## MR. MOLITOR'S EXPERT REPORT ON VISAYAN RAILROADS

During the recent discussion before the Philippine Commission which followed the application of Mr. E. J. Beard, Chief Engineer of Messrs. J. G. White & Co., Inc., Engineering Contractors for the Philippine Railway Company, asking the approval by the Governor-General of submitted definite plans of location of 20 miles of road on the Island of Cebú, from the City of Cebú to Argao, and 20 miles of line on the Island of Panay, from Iloilo to Pototan, Mr. F. A. Molitor, Supervising Railway Expert of the Philippine Government, found his position at such variance with the ideas of the Governor-General in the premises that he felt called upon to resign from the public service. The plans, specifications, etc., submitted by Mr. Beard were, in the opinion of the Supervising Railway Expert, not in compliance with the requirements of the law regulating the same, and at the outset he recommended the disapproval of both locations, together with the estimates covering both of the 20 miles that Mr. Beard sought authority to commence construction upon. These estimates showed a proposed expenditure of $47,473.03 gold, and $46,934.72 per mile on the lines on the Island of Panay and Cebú, respectively. It was primarily on the ground of the alleged excessive cost of these lines, as proposed by the concessionaries, that Mr. Molitor recommended disapproval. He also maintained that the plans submitted were not sufficient in detail to show wherein the alleged excessive cost of the lines lay, and in their absence he was unable to analyze the Chief Engineer's estimate.

In his non-concurring report to the Governor-General, through the Secretary of Commerce and Police, Mr. Molitor went deep into the details of his position, stating that he deemed it essential that in the first location submitted to the Governor-General for his approval, the greatest care should be observed in considering the various phases and factors which, he held, form a part of the most prominent




policy in respect of the construction of the railroads built under the concessionary grant, *viz.*, their first cost upon which the bonds will be issued, and the Government's liability thereunder. On the other hand, the representatives of the railway people claimed that the Government, under the franchise, had not the power or authority to limit the expenditure, and to offset this and other contentions made by the railroad people as to the unnecessity of filing complete maps, plans and specifications, the Supervising Railway Expert dissected the laws and the *Rules and Regulations* under which the railway construction, equipment and operation are to be carried on.

After showing where, in his judgment, Mr. Beard had failed to conform to the legal requirements in the plans covering the construction under consideration, Mr. Molitor thought that it was to the manifest interest of both parties to the contract that the work of construction should proceed as promptly as the guarantees were ready, and the railroad put in operation as early as possible; and therefore, to the approval of the line in sections as fast as it could be surveyed, he offered no objections. On the contrary he recommended that the grantees be facilitated in this respect so far as the Governor-General could consistently do so, but he recommended that consideration by the Governor-General of a provisional part or section of the survey should not release the granteem company from subitting all the detailed maps, profiles, specifications, etc., required by law. In his opinion it was essential that each and every item required under the *Rules and Regulations* for the filing of maps should be complied with in order that the class of construction the grantee company contemplated might be known, as well as to enable the Government to clearly and definitely ascertain why the estimated cost ran into such alleged excessive figures.

As evidence of the necessity of this data several details of the estimate were cited, which, unaccompanied by plans and specifications, left Mr. Molitor wholly in the dark. Sections and Tool-Houses, Shops, Engine-Houses and Terminals, Fuel-Stations, Docks and Wharves amounted to $2,590 gold per mile, or $103,600 for the 40 miles submitted, which would amount to $777,000 gold upon the entire system of 300 miles. In other words, the railway people submitted nearly $800,000 worth of construction in their estimate, unaccompanied by any plans or specifications to enable the Government to determine the character and kind of building they proposed spending this money for. The Supervising Railway Expert said that such analysis of the submitted estimate as he was able to make indicated that many of the items of construction were estimated upon a reasonable, equitable, and fair basis. For instance, most of the track items were conservatively estimated, as, perhaps, were the bridge and culverts. The grading, however, was, in his opinion, estimated too high in unit prices. As to the quantities, he was unable to determine them in the absence of more complete information. An examination of other items in the estimate, in which no plans were required to form a conclusive opinion, developed to Mr. Molitor the following:—

Right-of-way and Real Estate indicated an estimated price per acre of $26 gold, or $64.25 per *hectare*. He was unable to state whether this was excessive or not.

Legal Expenses at $130 gold per mile, covering the entire railway lines on a basis of three years' work, amounted to $30,000, or $13,000 *per annum*. While this item was unquestionably high in the opinion of Mr. Molitor, it was not excessively so.

Lighterage at $1,000 gold per mile, covering three years of construction work would amount to $300,000, or $100,000 *per annum*, which Mr. Molitor considered wholly unreasonable.

Storehouse Expenses, figuring for the entire work on their unit price, would mount to an expenditure of $9,000 *per annum*, which was regarded excessive. Equipment and Engineering considered to be not unreasonably estimated although Administration and General Expenses and Contingencies, amounting to $800 gold and $400 gold per mile, respectively, were considered exceedingly excessive. On the basis of the estimate, Administration, covering four years' work, would amount to $60,000 *per annum*, or $240,000 in total. The General Expenses and Contingencies amounted to $30,000 gold *per annum*, or $120,000 for four years.

Plant, $400 gold per mile, would amount to a total expenditure of $120,000 which was considered excessive unless one or more steam vessels was purchased.

Government Supervision, estimated at $500 gold, or on a basis of four years $150,000 in total, was about double the probable cost of Government supervision. On a basis of the amount billed against the railway company up to the present, Mr. Molitor said it would run about $200 per mile.

Freight estimates were not excessive.

The interest on the expenditure for construction to the date of bond issue with the total estimated cost, was considered reasonable. Mr. Molitor submitted, however, that as greater economy in the construction is practiced, the interest account and profit would be decreased in a direct ratio. The profit, based on the completion of the entire lines, at the submitted average cost per mile, would amount to $6,755 gold per mile, or $1,870,800 total.

Mr. Molitor pointed out that the estimated costs for Cebú and Panay were so nearly alike that the above criticisms could well answer for both, and he believed that these lines could be built for less money.

Coming now to the most important question which Mr. Molitor held confronted the Gov[illegible]

ment in the consideration of the first plans of location submitted, and contemplating an expenditure of approximately $47,000 gold per mile, it was pertinent, he thought, to consider the probable earnings of these lines. Estimates of gross earnings were largely conjectural, especially in the Philippine Islands. Ordinarily, railroad men, through statistical information, were enabled to arrive quite closely to the amount of freight and passengers that any new railroad line would hope to carry. The conditions in the Philippines precluded the possibility of estimating upon this basis, and, therefore, in making estimates of gross earnings, the Supervising Railway Expert eliminated the personal equation and resorted to definite and known figures, so far as procurable. These figures represented the population tributary to the proposed railway lines, and the known earnings of the Manila & Dagupan Railway.

The earnings of the Manila & Dagupan Railway for several years were very discouraging. The records showed, however, that during the past three years of American occupation the earnings had gradually increased, and in 1905 the gross earnings reached the sum of $847,410 gold, or $6,946 per mile. The population tributary to this railroad line was 500,000. Taking the same area tributary to the railroad lines in the Visayan Group as is tapped by the Manila & Dagupan Railway, we have:—

| | | | |
|---|---|---|---|
| Panay—Popular'n, | 240,000; | 95 mls. of prop'd. railroads | |
| Cebú— " | 315,000; | 80 " " " " | |
| Negros— " | 230,000; | 108 " " " " | |

Two-thirds of the gross earnings of the Manila & Dagupan Railway are derived from passenger receipts. The country traversed by this railroad is rich and productive, and is as good, if not better than the country traversed by the proposed railway lines in Panay, Cebú and Negros, according to Mr. Molitor; so, using the Manila & Dagupan Railway figures as a basis for estimating the probable gross earnings of the Visayan lines, was, in the opinion of Mr. Molitor, not unfair. He recognized, in this connection, that the railroad lines in the Visayan Group ran through a highly-productive country, with the exception of a comparatively small percentage. Unfortunately, however, this country was not at all in a good state of cultivation. With the energies of the normal people at work upon the soil, Mr. Molitor would say without hesitancy that the Visayan railroads would earn a good revenue, sufficient to pay a fair and reasonable dividend on the stock, besides the payment of fixed charges and the setting aside from year to year of a sum adequate to keep the lines in first-class condition; but unfortunately, at this time, this was not true. The country in Panay and Negros was not in a good state of cultivation, and in Cebú there was very little land to cultivate; so that if a comparison were made with the country through which the Manila & Dagupan road runs it was to the disadvantage of the Philippine Railway Company. Comparing the earnings of the Manila & Dagupan line with the probable earnings of the Visayan roads, there was, on the one hand, the known revenue of a railroad in operation a decade through a country whose producing power has probably been brought to a better state of cultivation than on Panay, Cebú and Negros, while on the other hand we had a country that is not in nearly such a state of cultivation, or so densely populated, and with a railway system still in the early stage of construction. Taking the earnings of the Manila & Dagupan Railway in 1905, and the population tributary to it as above indicated, Mr. Molitor showed the earnings capacity to be $1.20 gold per inhabitant, or $0.0098 *per capita* per mile. Applying this unit to the Visayan Group, the earnings were as follows:—

| | |
|---|---|
| Railroad on Panay | $2,400 per mile |
| Railroad on Negros | 2,300 " " |
| Railroad on Cebú | 3,100 " " |

As to the net revenue, Mr. Molitor expressed the belief that these railroads could be easily run from 40 to 50 per cent of the gross earnings, because the cost of operation here would be less than in the United States; provided the company was not overloaded with an excessive staff of administrative officers. The Manila & Dagupan line was operated for a little less than 40 per cent. Assuming, therefore, that the Visayan railways would be operated for 40 per cent we had 60 per cent for gross earnings applicable to taxes, betterments, and fixed charges, *i. e.*, payment of the interest on the bonds:—

| | |
|---|---|
| Railroad on Panay | $1,200 per mile |
| Railroad on Cebú | 1,550 " " |
| Railroad on Negros | 1,150 " " |

The fixed charges per mile *per annum* on the railroad costing $47,000 gold per mile, at an interest rate of 4 per cent, was $1,680 per mile, or a deficit of $450 per mile *per annum*, or on an estimated mileage of 283 miles $207,350 *per annum*, which the Philippine Government would be required to pay. In order for the Philippine Railway Company to meet its fixed charges on the above estimated gross earnings, the lines should not cost over $31,000 per mile Mr. Molitor doubted, however, from knowledge gained in the past few months, that these lines could be built for such an amount except in a very cheap and poor manner. This policy would not be consistent considering local and climatic conditions, which, on account of the excessive rainfall, are very hard on roadbed, bridges and materials entering into the trackwork, telegraph line, building, etc. However, Mr. Molitor expressed the belief that the subject was of sufficient importance to warrant most careful surveys and preparations of plans for construction to the end that the cost might be kept down to the lowest point compatible with a proper standard of construction, applicable and adaptable to local conditions; and he further more thought that a great effort should be made to keep the cost within $35,000 per mile.

Mr. Molitor also took exceptions to the location of the line on Panay, between Iloilo and Pototon, suggesting that a survey also through Zarraga should have been made for comparison with the one submitted, which lies through Santa Barbara, with a view to the cheaper construction.

## CANTON'S PUBLIC IMPROVEMENTS

According to the Canton (China) correspondent of the *South China Morning Post* large quantities of cast iron pipes have been received there for the new waterworks system. They vary in size from 4 to 24", the latter being the dimension of the mains The contract for the excavations and the laying of pipes has been awarded to a Chinaman, who is working in conjunction with Europeans. His tender was for over $300,000. The reservoir is to be located near the White Cloud Mountains, where there is an abundant supply of clear spring water of a high degree of purity. Water will be laid on to all parts of the city.

Canton is rousing herself without a doubt in the matter of public improvements. Among the squalid huts, not creditable as pig sties, among streets so narrow that two chairs can not pass, among byways dangerous to walk in, among cesspools where fish are fattened in a manner too filthy to mention, by open sewers and sewers under granite-paved roads with great gaping cracks, have been erected some exceedingly handsome dwellings. Electric light and telephones are in full swing and great improvements to the roads of the suburbs are being inaugurated.

Progress seems to pervade the atmosphere. Canton has no *lungs* and she wants them badly. It is said that in the years gone by, which in such an ancient city as Canton might date back to Noah, the streets were wider, but whenever a fire occurred the property owner, true to Chinese instinct, *squeezed* a piece of land off the road. It is no use to wait for fires now to turn the tables; whole streets must be demolished to put the streets in good shape. Such drastic measures, however, would necessarily displace a great population, and reforms can only be proceeded with slowly after every provision has been made. The buildings in Canton are very low, mostly one or at most two-story structures. Were the buildings high, fresh air would have but scant passage and the health of the people must suffer severely. Again, open drains are far safer than badly-constructed closed ones, from which leakage of air would be a constant danger, for such would cause a pestilence. The Cantonese are one and all tea-drinkers, and many would no more take water *straight* than jump over the moon. Now that they will be provided with a bountiful supply of pure fresh water, they may learn in time to think differently.

## SIAM'S RAILWAY DEVELOPMENT

A recent dispatch announces that the Government of Siam is negotiating a loan in London of £3,000,000, and in commenting on the loan the *Bangkok Times* says: "One of the first cases likely to be affected by the introduction of foreign capital is railway construction, since one obvious way of getting the work done is by the foreign contractor, or company, with a Government guarantee of a certain interest. The next foreign loan, for railways and other public works, would presumably have been issued by this time if the money market had been easier in Europe, but whether it is for three or more millions the Northern Railway will in all likelihood require all of that portion ear-marked for railway construction. Of course if it were such a work of public utility as the water supply for the capital, the Peninsula Railway would have to be postponed to a distant future. If the present brackish condition of the river gives any indication, we shall hear much about that water supply before the rains arrive, but we can not say that there is any immediate prospect of anything being done. The Peninsula Railway, however, is a different matter and as the importance of time in this instance seems to be recognized there is not likely to be any excessive delay in making the beginning. Under these circumstances the question of the investment of foreign capital in the enterprise becomes one of immediate interest Our London correspondent takes, naturally, the London viewpoint, and considers the reasons the financier has for looking askance at investments in Siam. But as regards railways, at least, Siam is equally nervous when the foreign contractor is mentioned. The contract for the Korat Railway proved a costly experience for this country, but the only lesson to be drawn is that Siam should not make the same mistake again. Before that contract was settled Mr. Bethge, the Director-General of Railways, was interviewed by the *Bangkok Times*, and openly stated that it would be impossible for Mr. Murray Campbell to carry out his contract at the price he had offered. Expert opinion generally concurred in this view, and no one doubts now that it was the correct view. Moreover, expert opinion also held that the offer of the firm of Krupp was too low. If Siam made the same mistake again she would know what to expect, but countries have often had railways built under such conditions as Siam could impose with advantage to herself in this instance. The point is worth emphasizing as there seems to be a general belief that if there is to be no delay some such method will have to be adopted. Delay can not be too strongly deprecated."

HEMPHILL'S ESTATE AND FINANCE COMPANY, HONGKONG.—The net profits of the company during 1906 amounted to $8,140,551.63. The balance brought forward from 1905 account was $5,071.68, making a total of $145,622.31. From this is deducted 5 per cent remuneration to the directors, 5 per cent remuneration to the general managers as commission on net profits amounting to $14,055.16 in all, leaving available for appropriation $131,567.15. A dividend of 8 per cent on the paid-up capital is to be paid to shareholders, absorbing $120,000. The balance of $11,567.15 is carried to the new Profit and Loss Account. The new directory consists of Messrs. A. G. Wood, J. S. Van Buren, J. Scott Harston, H. A. W. Slade, Ho Tung and J. Scott Harston, the last-named gentleman succeeding to the vacancy caused by the retirement of C. Ewens. Messrs. W. H. Gaskell and W. Hutton Potts are retained as auditors.

KOREAN SYNDICATE, LTD.—At the annual general meeting of the Korean Syndicate, Ltd., held recently at the company's offices, Salisbury House, London, Mr. H. E. M. Bourke, who presided, stated, according to *The Anglo-Japanese Gazette*, that the calls appearing in the balance-sheet as being in arrear, and amounting to £2,648, had since been reduced to £400. An amount of £2,642 had been expended upon development work. The title to the concession was granted by the Korean Government, with the approval of the Japanese authorities, on demand of the British Minister at Seoul, and gave the company very wide powers, including the construction of railways. The area of the concession was 216 square miles, and the consideration was a royalty of 1 per cent on the value of the output of the Suan Mine. Besides this, there was a yearly rental levied on the land in occupation, which only amounted in 1905 to £10. The work undertaken has proved highly satisfactory, judging from the assays given in the report.

# Paper-Making from Philippine Fibers and Fibrous Substances

Bamboo is the chief material in use in the paper-making industry of China. The Chinese employ the native bamboo, which they split into lengths of from 1 to 1.3 meters each and then place in a vat or tank with alternate layers of lime; water is then poured in to cover the stems and the whole left for three or four months. When the bamboo has become sufficiently rotted it is pounded in a mortar, mixed with water, and moulded into square sheets of paper.

A British authority (Mr. Routledge) was firm in the belief that only young shoots, collected before the plant had arrived at maturity and become hardened by a deposit of silicious matter, would be serviceable for paper-making, and it was upon this supposition that the main objections and practical difficulties to the use of bamboo for paper stock were based. It was also found at the time that the removal of young and tender stems from the growing plants was disastrous to the parent stock to such an extent that entire bamboo forests would be endangered, and that the cost of transportation of the young, succulent shoots from the jungles to the mill site would prohibit their economic use

As the only practical attempt at the manufacture of paper from bamboo, namely, that from the elephant grass of British Burma, resulted in the report that this particular species offers great restraint to chemical treatment, it was thought advisable by Mr. Richmond to experiment with at least two different varieties of Philippine bamboo in order to determine their value as compared with other graminaceous fiber plants to which they are closely related and also with pulp woods, which, because of their dense, woody nature, they so much resemble and with which they should perhaps more properly be compared.

PHILIPPINE BAMBOO.—The two most important and widely distributed Philippine bamboos are the common thick-walled variety, and the thin-walled dwarf bamboo, known as *caña-bobo*. The former is almost exclusively used for building purposes, because of its strength and durability. Dwarf bamboo is the variety in general use throughout the Islands for the manufacture of wooden products used for lining or filling the walls, ceilings, floors, doors, and shutters of nipa houses. This species is never cultivated

CHEMICAL COMPARISON WITH OTHER GRASSES.—The fibers of graminaceous plants exhibit a certain resemblance in form and appearance. Manifestly, papers made from these substances should possess very similar properties. The grass-like character of bamboo is further shown by the similarity of its chemical composition with that of other grasses. This will be understood by a study of the following table:—

| Constituents | Bamboo. | | | | Dwarf bamboo. |
|---|---|---|---|---|---|
| | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.* | *Per cent.*3 |
| Cellulose | 50.13 | 46 60 | 47.69 | 53.94 | 55.79 |
| Fat and wax | .78 | 1.49 | 1.93 | .96 | 1.07 |
| Aqueous extract | 10 56 | 8 07 | 9.05 | 4.98 | 4.60 |
| Noncellulose or lignin | 24.84 | 28.49 | 26.75 | 24.25 | 21.26 |
| Water | 8.56 | 9.85 | 11.38 | 12 40 | 11.26 |
| Ash | 5.13 | 5.50 | 3 20 | 3.47 | 6.03 |

PREPARATION OF PAPER CELLULOSE FROM BAMBOO.—The procedures employed for obtaining paper cellulose from esparto and the cereal straws are applicable to bamboo as well. Because of the great solvent action of alkaline solutions, comparatively little pains are necessary in the preparation of bamboo for the digestion process. First, there is no no bark to be removed, as in the case of the dicotyledonous pulp woods; fresh, mature stems need simply to be chipped, or better, cut in suitable lengths and crushed by passing between heavy, fluted rollers.

The quantity of alkali required to produce a well-boiled pulp from mature stems of the above-mentioned species of bamboo has been found to be 15 to 20 per cent caustic soda, calculated upon the gross weight of the material digested, which concentration yields from 40 to 50 per cent of a light-brown fiber, which has a clean and soft appearance suitable for wrappings, news, and book paper.

This consumption of alkali is not greater than is frequently necessary in practice for cooking esparto grass, and other graminaceous plants, such as the cereal straws, which are so largely employed in Europe for fine paper stock. These require from 10 to 15 per cent of caustic soda to yield 33 to 37 per cent of pure fiber.

On the other hand, the commercial pulp woods used in the production of soda fiber demand a much greater proportion of alkali for their complete resolution. The amount of caustic soda employed in practice, in making soda wood pulp can only be approximated. It is customary to add sufficient liquor of a known strength to cover the chips, and this volume depends, of course, upon the state of division of the wood, the thoroughness with which it is packed or tamped down, and the form of boiler employed. Griffin and Little give 700 gallons of liquor per cord of wood when rotary boilers are used, and a much larger volume in case stationary, upright digesters are employed. One thousand gallons of liquor, carrying 7½ per cent caustic soda (the average strength employed), would contain about 284 kilos (625 lbs.) per one cord of chips, but the weight of a cord of pulp-wood chips is very indefinite. Its approximate weight may be deduced indirectly, by knowing the amount of pulp a cord of wood will yield and the average percentage yield of pulp from a given wood by the soda process.

454.5 kilos (1,000 pounds) of pulp is considered an average yield from one cord of poplar wood. The average percentage of yield pulp of wood by the soda method of treatment may be given as 40 per cent. Thus 454.5 kilos of pulp represent 1,136.3 kilos (2,500 pounds) of wood, and one cord of wood (1,136.3 kilos) consumes 284 kilos of caustic soda, or 25 per cent, calculated on the gross weight of the wood.

The above calculation demonstrates that mature bamboo is much more easily resolved into paper fiber than is the most generally used wood employed for the manufacture of paper pulp by the soda process.

PRELIMINARY PREPARATION OF BAMBOO TO DIGESTION EXPERIMENTS.—At first the outer, silicated rind and the nodes or joints of mature culms were digested separately but it was found that the latter yielded to alkaline treatment with the formation of very little shive, but with a less cellulose content than when internodes alone were used The yield of pulp on the nodes and rind, respectively, was 35 per cent, as compared with one of 42 per cent on internode wood alone, under the same conditions. This deficiency is fully accounted for by the larger amount of mineral matter deposited in the joints and on the exterior surfaces of the mature bamboo stems

All experiments in this direction showed that in practice the joints or nodes, if well crushed, would offer no resistance to caustic soda liquors and that it would not be necessary or even advantageous to effect any preliminary sorting between the different portions of the stem hence in the recorded experiments no separation was practiced. Bamboo pulp, similarly to straw and grass fibers, shows a tendency to roll up into little balls under slow motion so that rotary digesters would probably prove unsuited to this raw material.

EXPERIMENTAL PART.—All of the digesting and bleaching experiments tabulated below were made on 454 gram lots (1 lb.) of air-dried material. The bamboo chips or sticks were packed into an upright digester, variable quantities of caustic soda liquor, in all cases sufficient to cover the chips, were added, and the heating was done by direct flame.



LONGITUDINAL VIEW OF STRUCTURAL BAMBOO

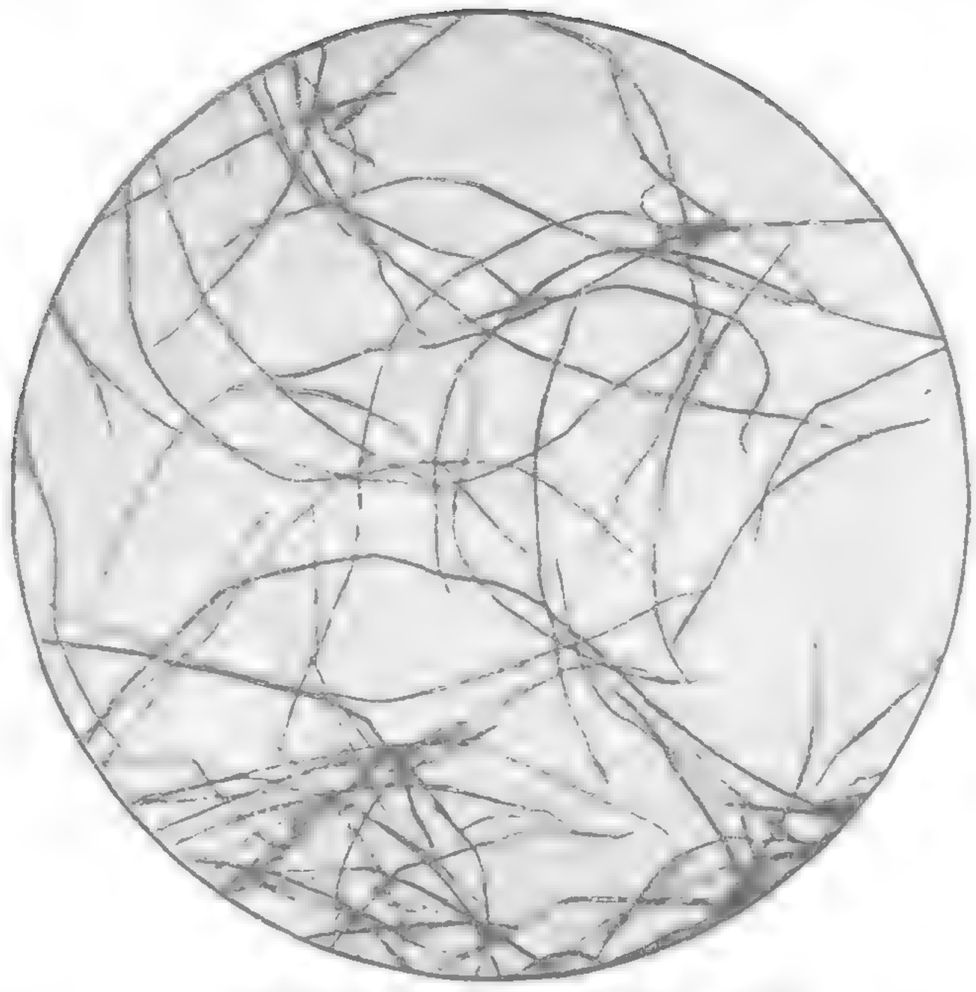


LONGITUDINAL VIEW OF DWARF BAMBOO

*Condensed from a paper by *George F. Richmond*, Government Chemist.



LONGITUDINAL VIEW OF COIR FIBER



LONGITUDINAL VIEW OF BURI-PALM FIBER

| Experiments. | Conditions of digestion. | Strength of liquor ... per cent. | Amount of caustic soda calculated on the weight of the material digested per cent. | Time of boiling ... hours | Pressure ... atmospheres. | Yield of pulp: Unbleached ... per cent | Bleached ... do ... | Amount of bleaching powder consumed ... per cent | Loss of weight in bleaching ... do ... | Color. |
|---|---|---|---|---|---|---|---|---|---|---|
| VI. | | 15 | 22½ | 12½ | | | | | | |
| IV. | | 5 | 5 | 10 | | | | | | |
| III. | | 6-7 | 5-6 | 5-7 | | | | | | |
| | | | | | | | | | | |
| | | 10 | 5 | 5 | 5 | 49 | 46.8 | 50.1 | | |
| | | 10 | 5 | 5 | 6 | | | | | |
| | | | | | | | | 16.1 | | |
| | | 10 | 5 | 5 | 5 | 45.6 | 42.6 | 9.0 | 13.3 | |
| | | 4 | 22½ | 10 | 5 | 47.22 | 41.4 | | | Cream cream |

The experiments outlined above bring out the following considerations.—

First. Dwarf bamboo is superior to the structural variety both in yield of unbleached pulp and in consumption of bleaching agent.

Second. Caustic soda, in the proportion of 10 to 20 per cent, calculated on the gross weight of the canes, is sufficient to produce a well digested pulp

Third The duration of the digestions and the pressures and corresponding temperatures carried are considerably less than are employed in pulping the common, soft woods by this process, and compare very favorably with those used in practice for straw cellulose manufacture.

Fourth. The structural bamboo requires excessive quantities of bleach (20 to 25 per cent) to produce at best a poor white, while the dwarf variety, on the other hand, is bleached a good white with the equivalent amount of powder consumed by annual and perennial straws, namely, 10 to 20 per cent.

PALM FIBERS.—Several species of the other *Palmæ*, including rattans, betel-nut palm, nipa palm, buri palm, and coconut palm, are found widely distributed throughout the Archipelago and contribute to the local demands of the people for food and fiber

The *bejucos* or rattans, which occur so plentifully throughout forested regions, are used principally for the manufacture of furniture, and they are far too valuable to be otherwise primarily employed. The various pieces of furniture into which rattans so largely enter are constructed entirely of this material and dwarf bamboo, so that old or worn-out articles of this class could be utilized at a paper mill without any preliminary cleaning or sorting.

*Betel-nut palm* is found both in the wild and cultivated state.

*Nipa palm* is a well-known and valuable plant which for the most part is cultivated. As this plant is found only within the influence of salt water, near the seashore, and as considerable commerce in the leaves of this plant for thatching purposes is already established, the long leafstalks, which contain a strong structural fiber but which are at present discarded as worthless, are available in large quantities.

*Coconut palm.*—The commercial fiber of this plant, known as *coir*, is found in the husk or fibrous pericarp surrounding the nut. There is no established commerce in *coir* or coconut fiber in the Philippines, but there is a large and growing industry in copra, and coconut oil production is steadily increasing. Practically all the husks encountered in the coconut districts are dry, brown, and unfit for *coir* cordage, so that at the present time they are only used for fuel or thrown away. That the amount of coconut husks annually consumed is considerable is evidenced from the statistics on copra exportations. In 1905 approximately 60,000 tons of copra were exported. This represents over 400,000 tons of nuts, which in turn represents an approximately equivalent weight. These data do not include the vast quantity of nuts husked for local consumption, nor the nuts and oil exported as such

As copra and oil will probably always be the products of first value in this industry, the husk produced and now almost exclusively used for fuel will be of a very inferior grade and their usefulness for purposes other than fuel will, on this account, be limited. However, coconut husks contain considerable fiber, and as they are now a rather worthless by-product of a large and rapidly growing industry, and as this fact assures their availability in almost unlimited quantities, they are worth considering from the standpoint of their applicability for paper or pulp manufacture.

Lengthy experimentation with coconut husks has shown that the fibers can not economically be separated from the cellular matter in which they are embedded, at least not by caustic alkalies. A treatment sufficiently drastic to remove this nonfibrous matter not only causes too great an expense in the chemicals involved but seriously attacks the fibers themselves; furthermore, this class of fiber is not amenable to bleaching processes.

For the production of pulp for purposes other than paper this material appears both cheap and admirable. As a substitute for wood pulp in the manufacture of various commodities such as roofing and felting materials, in which case a complete removal of the corky layers is not necessary or advisable and where bleaching is not required, the husks could be prepared by mechanical means alone or by mechanical means followed by a mild alkaline treatment. In the dry state in which the husks come to the consumer they are easily roughly cleaned to form a tow-like mass of fibers, which greatly resembles oakum, and which represents from 40 to 60 per cent of the gross weight of the husk, depending upon the quantity of corky matter still adhering to it.

In those countries where coir fiber is an article of commerce, the husks are first crushed between heavy, fluted rollers, then passed through the extractor, which consists essentially of a cylinder covered with steel teeth which tear the fiber from the husk, and then a subsequent winnowing removes the short fiber and dirt.

*Buri palm* is second only to the coconut palm in the variety and usefulness of its products. The tree is never cultivated, but it grows luxuriantly in a wild state in many sections of the Islands. The Recoleto estate in Southwestern Mindoro contains hundreds of thousands of individuals of this species. One of the principal uses of this palm is to furnish material from which mats and sugar sacks are made. The leaf is the only part suitable for these purposes. The long leafstalk, which contains abundant structural fiber, is employed for making fine hats and coarse ropes and twine. Throughout Panay, where this palm is widely distributed, it furnishes practically all the cordage fiber in use. Good-loking rope is made by beating

*(Continued on page 302.)*

# INDUSTRIES OF THE BRITISH NORTH BORNEO TRADING COMPANY

The North Borneo Trading Company, Ltd., is a substantial and enterprising general engineering, shipbuilding, planting and timber exporting concern of British North Borneo. Its operating headquarters are at Sandakan, where a fine, well-sheltered harbor permits of the loading of sea-going vessels without interruption. Besides its own enterprise, the company has the sole agency in Borneo and the Philippine Islands for Messrs. McKie & Baxter, Copland Works, Govan, Glasgow, engineers and shipbuilders, and is contractor to the British Admiralty, the War Office, several foreign governments, and the principal buyers of Great Britain and other countries. Communication is kept up between Sandakan and Singapore by steamers leaving regularly every 14 days from both ports. One of these steamers goes on to Zamboanga, Moro Province, P. I.; another vessel leaves Singapore for Medano *via* Borneo ports and Zamboanga, and still another touches at Southeastern Borneo ports. Messrs. Behn, Meyer & Co., Ltd., have carefully prepared timetables for these three vessels, and intending visitors can plan their voyage with ease because of the certainty of close connection. Messrs. Melchers & Co. and Messrs. Jardine, Matheson & Co., of Hongkong, will furnish information of sailing dates for the steamers *Borneo* and *Mausang*, which vessels maintain a regular trade with that port and Sandakan.



ROUGH TOP ENCLOSURE BETWEEN THE NORTH BORNEO TRADING COMPANY'S TWO WHARVES; MILL AND OLD WORKSHOP, SAWMILLS, SHIPBUILDING SHEDS, OFFICES, ETC., IN THE BACKGROUND

Shipbuilding Yard.—The company's shipbuilding yard is capable of turning out any kind of wooden vessel up to 500 tons, and it has constructed for local and foreign buyers steam launches, schooners (both sail and steam, small and large), lighters and lorchas. The company's resources enable it to select the best material for construction of hulls, and as all machinery is imported direct from Great Britain, buyers can rely on obtaining the greatest efficiency at moderate cost. The workshop is capable of dealing with engineering work of all kinds and a large stock of engineers' stores are kept in hand. The whole is under the supervision of a certified engineer. Prompt attention is given to inquiries for marine machinery, boilers of all kinds, steel vessels, fast launches, stern and sidewheel steamers of light draft, and composite yachts, etc., "Challenge" centrifugal pumps and engines for dock work, salvage purposes and use on board ships, and compound and triple engines for mills, factories and other manufacturing industries. The company's works are located about three miles inside Sandakan Bay and vessels drawing 18′ can moor alongside the wharf.

Planting and Timber Holdings.—The company owns over 103,000 acres of freehold (999 years) land around Sandakan Bay. The land is well selected, situated on navigable rivers and suitable for the cultivation of rubber, tobacco, coffee, sugar, hemp, coconuts and all other tropical products. The company has cultivated all of the above mentioned products and is at present putting para rubber on the market from its estate at Sikong. It is the successful pioneer of the rubber industry in British North Borneo and has now to meet the demands for seeds and stumps of other companies that have profited by its experience and are now operating along the same lines. The company is prepared to lease a part of its land on advantageous terms to planters who are unwilling to invest capital in land until they can do so from the returns on their crops.

In addition to freehold property the company has hundreds of square miles of leased forest lands over which it holds timber-cutting rights. Its steam sawmills are located at Sandakan one mile from the town, with frontage on the harbor. Rough supplies are brought in by lighters and rafts from the rivers in and outside the bay territory, and shipments are made from Sandakan and the company's working in Cowie Harbor, which is 270 miles from Sandakan. The sawmills are capable of handling all classes of timber in lengths up to 60′, and large stocks of standard building sizes in a variety of woods are kept on hand. Railway sleepers are cut to order in any dimension, while first-class hardwood piling and logs either in the round or rough hewn square can be supplied at short notice. The company's timbers are well-known in a great many markets and prospective buyers may obtain results of tests and dealers' opinions from the company's Sandakan office or its duly authorized agents in China and elsewhere. The company exports to England, Europe, India, China and Singapore, piles, poles, round and rough hewn squares and timber sawn to any specification. Railroad ties figure largely in the company's business and it is rapidly extending operations to meet the increasing demand. The following descriptions of Borneo timbers will be useful to buyers as a guide to the selection of suitable materials for their requirements. Maximum girth or size of square is not given with extreme lengths; the sizes specified are for lengths up to 30′ and they can be materially increased for lengths of about 20′.

Description of Borneo Woods.—[illegible] *or Borneo Ironwood* (*sp. gr. 80).—A first-class heavy hardwood of solid texture [illegible] recently cut the color is a pale-yellow which rapidly darkens with exposure until it becomes almost black. It is principally used for piling and marine work as it offers great resistance

* Specific gravity in pounds per cubic foot of seasoned timber.



WHARF OF THE ENGINEERING SHOP



NORTH END OF ENGINEERING SHOP



SAWMILLS AND SHEDS WHERE NATIVE HARDWOOD PRODUCTS ARE STORED FOR EXPORT



BOILER-HOUSE OF THE MILLS; SHIPBUILDING SHEDS AND CORNER OF WORKSHOP IN THE DISTANCE

the teredo. It is almost impervious to decay nd can be used for posts and pillars with arth foundations. It is obtainable in round gs up to 40′ long and 18″ diameter and in ugh hewn logs up to 30 to 18″ square. *Se-ingan batu* (*sp. gr.* 62)—A hard wood of the obtainable in round logs up to 50′ and 24″ diameter and rough hewn logs up to 30′ and 24″ square. *Griting* (*sp. gr.* 54)—This is a timber of the Superior Group. Its pores are scarcely perceptible and the texture is compact, fine and particularly smooth. Color texture, fibrous and smooth; color varies from very light-to dark-red. It is greatly in demand for house-building, both interior and exterior work, furniture-making, railway ties, carriage and wagon works; naval construction for outside planking and lining It is tenacious,



TAPPING PARA RUBBER TREES, AND A STAND OF YOUNG TREES, COMPANY'S SIKONG ESTATE

chest grade; solid and fine texture, breaking ng splinters, and capable of bearing great verse stress. Its length and durability irably adapt it for wharf decking, sleepers ilway ties, bridge work, beams, joints, ng and any work necessitating the employ- f the best material. It is largely used val construction for keels, etc. Color from yellow-brown to dark-red. It is light-red, has an excellent reputation for resistance to the sea worm and is largely used for wharf piles and all work exposed to the action of the weather. It is very suitable for wagon-building, framing and general construction. It is obtainable in round logs and piles up to 45′ and 18″ diameter and rough hewn logs up to 30′ long and 12″ square. *Camphor* (*sp. gr.* 46)—This is a hardwood of compact resisting well all transverse pressures, and is a thoroughly reliable and generally useful timber. Round logs up to 40′ long and 30″ diameter; rough hewn logs up to 35′ long and 24″ square. *Kruen* (*sp. gr.* 50)—Similar to foregoing and obtainable in same dimensions but is more uniform in color, being a good dark-red and not quite so compact in texture.

(*Continued on page 304.*)



LARGE STEEL SCHOONER BUILT BY THE COMPANY



PREPARING TO LAUNCH A BIG LIGHTER

## PAPER-MAKING FROM PHILIPPINE FIBERS AND FIBROUS SUBSTANCES

*(Concluded from page 299.)*

the fresh, green leafstalks until the fibers are partially separated, and then, after drying, these are twisted into cordage of various sizes.

Only *coconut husks*, which were taken to represent the class of fiber to be obtained from any palm fruit-pericarp, and *bari palm* rope fiber, which was considered to typify the class to be obtained from the leafstalks palms, were studied.

EXPERIMENT PART COCONUT FIBER.—*Experiment I.* The fibrous tow, prepared by shredding dry husks by hand, was digested for three hours at 4 to 6 atmospheres pressure with an excess of 2 per cent caustic soda solution. A yield of 47.70 per cent was obtained. *Experiment II.* Uncleaned husks, cut up into fine pieces and treated as outlined in Experiment I, gave a yield of 26 per cent. *Experiment III.*—Fibrous tow prepared as in Experiment I, digested during seven hours at 6 atmospheres pressure with lime and soda ash in quantities sufficient to form 20 per cent caustic soda calculated on the weight of the material treated, produced a 40 per cent yield of well-pulped fiber containing some undissolved foreign matter. BURI PALM ROPE.—*Experiment I.* Old worn rope was cut up into small pieces and digested for six hours at 4 to 5 atmospheres pressure with a 2 per cent caustic soda solution. A yield of 50.1 per cent was obtained. *Experiment II.* New 1-inch rope of this fiber, purchased in the open market and subjected to the same conditions as in Experiment I, gave a yield of 37.3 per cent.

Palm fibers, as has been stated, do not bleach readily, hence no quantitative bleach experiments were conducted with these pulps. Hand made sheets of unbleached paper made from palm fibers were found to be strong and fairly free from shive.

The local profusion of this family of plants and the vast quantities of available waste material resulting from the well established copra, sugar sack, and nipa thatch industries makes it worthy of attention.

## "THE LOS ANGELES TIMES" WINTER NUMBER

THE REVIEW has received a copy of the special Midwinter Number of *The Los Angeles (Cal.) Times*, which proves to be one of the largest and most interesting illustrated exponents of the climatic, industrial and commercial advantages of the thriving city of Los Angeles and of Southern California and other Pacific slope territory, that has ever been attempted. Among the many contributed articles which should command general attention are the following by Mr. Walter J. Ballard, the versatile American statistical and commercial writer, whose contributions appear in many of the leading newspapers of the United States:—"Electric Power in Los Angeles," "Petroleum Furnishes Cheap Fuel for Factories," "Mild Climate and Freedom from Strikes Encourage Factories," "Canning Fruits and Vegetables in Southern California," "Banking in California Has Been a Great Success," "California's Public Debt," "Remarkable Progress," "What We Live On," "Remarkable Growth," "California's Wine Industry," "Romantic and Eventful History of Arizona," "Smelting and Refining Copper in Arizona," "Churches of Arizona," "Foreign Commerce of Arizona," and "Annexation Profitable to Porto Rico." General Harrison Otis, who conducted the California party to Manila *via* oriental ports, last summer, is editor of *The Times*.

## NOTEWORTHY SHIPPING INCIDENT

According to London authority, the most noteworthy incident in the shipping record of the Far East for 1906 was the transport of the Russian prisoners from Japan to Vladivostok, and the troops from Vladivostok to Odessa. Up to the time when the specially-appointed commission announced that the process was complete so far as sea transport was concerned, about 45 steamers had been chartered. Of this number 27 were British, eight German, and the balance Russian. The British steamers, such as were not fixed on time charter, obtained prices varying from £9 10s. per head, when the charterers supplied the food, to £23 roubles when the owners supplied the food. The official figures show that about 1,000,000 souls were dealt with after the war, as follows:—500,000 returned by the Transsiberian Railway, 140,000 returned by sea, 60,000 Siberians walked home, 60,000 remained as colonists, 100,000 remained as railway guards, and 150,000 remained as the Manchurian Army depot. Apart from the above, nothing of interest occurred, but the small German and Scandinavian steamers were flocking home all the year, driven out from their happy hunting grounds, the seas of China and Japan, by the cheap Japanese steamers.

## N. Y. K. STEAMER "HITACHI-MARU"

The fine new Nippon Yusen Kaisha steamer *Hitachi-maru*, built and engined by the Mitsu Bishi Dockyard and Engine Works, Nagasaki, is now on her maiden voyage, having recently sailed from Yokohama with a cargo of 580 tons for Antwerp. She is commanded by Captain Townsend.

The *Hitachi-maru* is a duplicate of the ill-fated *Hitachi-maru*, sunk in the late Russo-Japanese War and is considered by experts who have inspected her one of the best all-round marine constructions that has ever been turned out by a Japanese shipbuilding company. Her keel was laid January 18th, 1906, she was launched September 22d, and was completed and delivered to the owners December 12th, 1906. Her length (B. P.) is 445′, breadth (moulded) 52′ (3′ more than ships of a similar class in the Nippon Yusen Kaisha Fleet), and depth (moulded) 33′ 6″. She has a gross tonnage of 6,715 and a net tonnage of 4,163, and her triple expansion twin-screw engines of 5,519 i. h. p. give her a speed of 15.67 knots with a coal consumption on the official trials of 1.4 lbs. per horse-power. Her hull and machinery were built to the Teishinsho Regulations and under Lloyds Special Survey and is classed 100 A1, M. C. She affords accommodation for 34 1st-class passengers, 24 2d-class 12 intermediate, and 174 3d-class passengers. Her accommodations are complete and magnificent in every detail, corresponding most satisfactorily with the passenger classes. She is a model and modern ship throughout.

## AUSTRALIAN COAL TRUST

The largest commercial scheme ever formed in Australia, according to Mr. F. W. Godin, American Consul, has recently been completed in New South Wales, which included all but one of the coal-mining companies in the Newcastle District and the shipping companies controlling the sea carriage of interstate commodities. There are 31 collieries and six steamship companies represented in the combine. The *vend* will control the coal mines, will regulate the sale of coal, and, with the exception mentioned, the entire trade operations of the northern district will be directed and controlled. It will also regulate the output of each mine, and will be in a position to generally improve trade conditions, but those interested say that its object is more to prevent unnecessary competition among themselves than to raise the price of coal above a reasonable figure. For the foreign trade many factors have been taken into consideration, the arrangement being much more elastic than that for the interstate trade.

The output is governed by an agreement by which each mine is allowed to mine coal equal to the average annual output for the past three years. If a colliery sells more coal than the amount allotted by the *vend*, such colliery must pay into a fund 98 cents for each ton so sold. The money in this fund will be used to compensate owners whose output does not reach the full percentage allotted to them, at the rate of 98 cents per ton for each ton below their allotment, but the penalty imposed and the compensation made will vary with the grade of the coal, there being three grades. After January 1st, 1907, the minimum price of the highest grade will be $2.43 gold; of the second grade, $2.25; of the third grade, $1 per ton. There is a committee of management in Newcastle and a board in London. Through the latter all contracts for coal destined beyond Australia are arranged.

The formation of this *vend* is welcomed by owners, miners, and the public alike. For many years there has been disastrous competi-



NIPPON YUSEN KAISHA'S NEW STEAMER, "HITACHI-MARU," "BUILT BY THE MITSU BISHI DOCKYARD AND ENGINE WORKS, NAGASAKI



Reproduced from *The Empress*, Calcutta.

NEW GRAVING DOCK AT COLOMBO, SHOWING THE FIRST SHIP IN

tion among the colliery owners of this district, many of the mining troubles that have occurred undoubtedly being traced to that cause, hence the unanimity of the feeling regarding it. To the Newcastle District, and to the State, the increase in price will mean a great deal, for every 25 cents gold of a rise in value, per ton, will represent about $1,250,000 per year added to the total amount received for its coal. To what extent the formation of the *vend* alluded to conflicts with the Federal Anti-trust Act remains to be seen. However, the Federal prime minister has stated on the floor of Parliament that, as formed, the *vend* will not be affected by the enforcement of the Act, while the best legal talent is of opinion that the *vend* has nothing to fear therefrom.

## GRAVING DOCK AT COLOMBO

The new graving dock at Colombo was recently opened. It represents an outlay of about $2,000,000 and is the largest of its kind in eastern seas. The dock lies nearly due east and west, a jetty 130′ long running out parallel to center line on the south side of the entrance, and a guide pier 700′ long on the north side of the entrance. The length over all of the dock, i.e., from cope line of entrance to cope line at the head of the dock, was originally 663′, but another 100′ extension was authorized by the British Government, making the length over all 763′ and the length over floor 700′, the width between main copings 113′ and the width of floor 63′. The depth of floor below low water at ordinary spring tides at head of the dock is 33′, and at stern 34′, the narrowest width between copings of the entrance being and depth of the invert of entrance below water of ordinary spring tides 30′.

In the pumping station which lies to the northwest of the dock are two main pumps capable of emptying the dock in four hours, each is of the single inlet centrifugal type revolving horizontally, having the vertical spindle driven direct by a horizontal compound steam engine. There are also two sets of single-acting lift pumps for leadage purposes, each driven by a vertical compound engine, also a compound steam-pumping engine and accumulator for maintaining the hydraulic pressure of 700 lbs. per square inch, which is available for working the penstocks and capstans. The commodious engineroom and the Titanic 500 h.p. engines and lesser apparatus form one of the most interesting sights at the dock.

The steamer *Monkseaton*, 325.6′ in length, 45′ in breadth and 26.4 deep, with a draught of 21′, was the first ship to enter the dock. When the ship entered the dock the caisson was placed in position and water immediately admitted in to sink it. This did not occupy much time, and presently the dock was closed. The dock then held 70,000 tons of water less the displacement of the vessel, about 2,772 tons, and the pumping gear commenced the task of emptying out this enormous quantity. The contract time for this work was four hours. The work is, however, done in 3½ hours and with a ship in it may be done in even less time. The docking of the *Monkseaton* was most satisfactory in every respect.

## INDUSTRIES OF BRITISH NORTH BORNEO TRADING COMPANY

*(Concluded from page 301.)*

*Pangas* (*sp. gr.* 48)—A hardwood of firm texture; color dark-red, with black figure, makes up into very handsome furniture, panelling, counters, and all descriptions of cabinet work. Round logs up to 30′ long and 15″ diameter; rough hewn logs up to 20′ long and 12″ square. *Seraiah Mira* (*sp. gr.* 35)—A soft-grade wood very similar to cedar. Color ranges from very light-to dark-red. It is largely used in house-building, furniture-making and boxes of all descriptions. Its color, weight, freedom from odor, and easy working qualities are particularly suitable for cigar-boxes and tea-chests. Round logs up to 40′ long and 30″ diameter; hewn logs up to 25′ long and 24″ square. *Merabau* (*sp. gr.* 60)—A first-class hardwood of great toughness and durability. Its color ranges from a reddish-yellow to a reddish-brown. It has a fine texture, polishes well and makes a handsome appearance. It is used for a variety of purposes, such as cabinet- and furniture-making, panelling, railway carriages, deck houses, etc. Dimensions obtainable in round logs up to 35′ and 40″ diameter rough hewn logs up to 25′ long and 36″ square. *Seraiah Putch* (*sp. gr.* 35)—Similar to red variety in every respect excepting color, which is white. It is used for the same purposes and is obtainable in the same dimensions. *Gagil* (*sp. gr.* 43)—A hardwood possessing the same good qualities of Camphor. Texture is firm and smooth. Color a reddish-brown darkening with exposure. Obtained in equally large dimensions. *Obar Suluk* (*sp. gr.* 43)—A medium, grade and very fine wood of a dark-red color. It is extensively used in house-building, furniture-making, railway and naval construction and joinery. Its elasticity and durability recommend it for general purposes. Round logs up to 40′ long and 40″ diameter; rough hewn logs up 30′ long and 36″ square. *Barat* (*sp. gr.* 56)—A first-class hardwood. Color reddish-brown, compact texture with hardly perceptible pores. Stands exposure well and is in demand for piles, telegraph poles, posts, pillars, etc. Obtainable in lengths up to 35′ and 15″ diameter. *Bakau* (*sp. gr.* 56)—A hardwood in great demand for foundations and piling in reclamation work. Obtainable in lengths up to 40′ and diameter of 12″. *Selangan Kacha* (*sp. gr.* 45)—Slightly superior to Gagil.

## PHILIPPINE HEMP MARKET, JANUARY, 1907

*(Courtesy of* C. N. Nicholson, *Secretary Manila Chamber of Commerce.)*

| | | |
|---|---|---|
| Arrivals of hemp at Manila.. | | 43,277 *Bales.* |
| Arrivals of hemp at Cebú..... | | 12,488 " |
| Arrivals of hemp at all parts..... | | [illegible] *Bales.* |
| Stock on hand at Manila and Cebú, January 1st. | | 63,432 *Bales.* |
| TOTAL | | 119,197 *Bales.* |
| [illegible] | 69,175 *Bales.* | |
| [illegible] ..... | 400 | 69,575 *Bales.* |
| [illegible] January 1st | | 49,622 *Bales.* |

### EXPORTS

| *Date* | *Vessel* | *London* | *L'pool.* | *Atlantic U. S. A.* | PACIFIC EAST *California* | *Australia* | *Other pts.* | *Total Bales* |
|---|---|---|---|---|---|---|---|---|
| Jan. 2 | Tean..... | 200 | ..... | ..... | ..... | ..... | ..... | 209 |
| " 4 | [illegible] | | | | | | 151 | 151 |
| " 5 | Rubi..... | 900 | ..... | ..... | ..... | ..... | 500 | 1,400 |
| " 7 | Lyra..... | 800 | 400 | ..... | 300 | ..... | ..... | 1,500 |
| " 11 | Yuensang..... | ..... | ..... | ..... | ..... | ..... | 350 | 350 |
| " 11 | Zafiro ..... | 650 | ..... | ..... | ..... | ..... | 500 | 1,150 |
| " 14 | Manila..... | ..... | ..... | ..... | ..... | ..... | 200 | 200 |
| " 15 | Tean..... | ..... | ..... | ..... | ..... | ..... | 202 | 202 |
| " 18 | Rubi..... | 800 | ..... | ..... | ..... | ..... | 200 | 1,000 |
| " 19 | Nikko Maru..... | ..... | ..... | ..... | ..... | ..... | 164 | 164 |
| " 21 | Ambria..... | 2,720 | ..... | ..... | ..... | ..... | 794 | 3,523 |
| " 1 | Isla de Luzon..... | ..... | 2,750 | ..... | ..... | ..... | 46 | 2,796 |
| " 25 | Chingtu..... | ..... | ..... | ..... | ..... | 400 | 40 | 440 |
| " 25 | Shawmut..... | ..... | ..... | ..... | 2,300 | ..... | 200 | 2,500 |
| " 26 | Candia..... | 9,744 | 3,789 | ..... | ..... | ..... | 250 | 13,783 |
| " 29 | Wray Castle..... | ..... | ..... | 20,001 | ..... | ..... | ..... | 20,001 |
| " 29 | Tean..... | 698 | 150 | ..... | ..... | ..... | ..... | 848 |
| " 31 | Sungkiang, Cebú.... | 2,379 | 300 | ..... | ..... | ..... | ..... | 2,679 |
| " 31 | [illegible] | [illegible] | | | | | | [illegible] |
| " 31 | Candia, Cebú..... | 5,486 | 1,887 | ..... | ..... | ..... | 100 | 7,473 |
| " 31 | Wray Castle, Cebú.. | ..... | ..... | 7,000 | ..... | ..... | ..... | 7,000 |
| | TOTAL..... | 26,198 | 9,276 | 27,001 | 2,600 | 400 | 3,700 | 69,175 |

# FAR EASTERN ENGINEERING, CONSTRUCTION, COMMERCIAL AND FINANCIAL NEWS

## ELECTRIC RAILWAYS, LIGHTING, POWER, ETC.

MUNICIPAL TELEPHONE SYSTEM, VLADIVOSTOK.—A contract for a municipal telephone system for Vladivostok has been awarded to the Russian branch of a German firm. The annual subscription for a single instrument is to be $38.62 gold.

SUBURBAN ELECTRIC RAILWAY, MANILA.—The Manila Suburban Railway Company, which is an adjunct of the Manila Electric Railroad and Light Company, has secured a franchise from the Philippine Government to build a branch line to Taguig *via* San Pedro Macati, and has been given the right to transport freight, express packages and baggage over its lines.

TIENTSIN ELECTRIC TRAMWAY.—Electric cars are now running through the French Concession at Tientsin. The route is across the International Bridge and through the Rue Courbet, Rue de Baron Gros, Taku-rd and so into the Japanese Concession. The question of continuing the system through the Japanese Concession has finally been favorably settled.

NEW TELEPHONE SYSTEM, BANGKOK.—The Minister of Public Works for Siam has received the sanction of the King to the proposal to acquire and install an entirely modern and up-to-date telephone system in Bangkok. The system decided on is the central battery system. The installation will go to public tender. The Minister is also arranging for a new cable from Koh-Si-Chang to Siracha with connection to Bangkok. When an efficient service is established there, it will be an inestimable boom to the shipping community.

COMPROMISE EFFECTED.—The Yokohama Electric Railway Company and the Buso Electric Company, which have been competing with each other to obtain official permission to build railways to Kamakura along the same route, have arranged a compromise. The Buso people have conceded the line to the Yokohama Electric Railway Company, while the Buso people will construct a new line to Byobugaura from Yokohama, thence to Kamakura and to Misaki along the outer coastline, and thence to Uraga-machi. The surveys are now being carried out.

ELECTRIC RAILWAYS, JAPAN.—The early construction of three electric tramways in the northern portion of the Japanese Island of Kyushu is under contemplation. The first, to be built from Moji to Kokuri, a distance of eight miles, estimated cost $350,000 gold; the second, from Moji to Yawaka, 12 miles in length, at a cost of $500,000, and the third, one of 23 miles, between the important towns of Fukuoka and Kokura, at an estimated cost of $1,250,000 gold. Catalogs should be sent to the Mayor and Chamber of Commerce of the cities of Moji, Fukuoka, Kokura, and Kumamoto.

HYOGO ELECTRIC RAILWAY COMPANY.—The prospectus is now published of this company, which has just obtained a charter from the Japanese Government to construct an electric railway between Hyogo and Akashi. The company's business is to run an electric car service between these two places, to supply electric motive-power, and engage in all other necessary business. The authorized capital of the company is -Y-2,000,000, in 40,000 shares of -Y-50 each. Of this number only only 5,000 shares are placed on the market the remaining 35,000 shares being taken up by the promoters and patrons.

ELECTRIC TRAMWAYS, SHANGHAI.—In a recent report the Municipal Engineer of Shanghai dealt with the construction of the new bridges across the Whampoo River for the accommodation of the electric tramway. With reference to the New Garden Bridge he stated that in the north dam 40,000 cubic feet of mud had been removed, leaving 2,500' more to be removed. The dam is remarkably water-tight. Within a foot of the bottom a little water *wells* up in the center and makes it possible that great trouble would have been experienced had the foundation level been a few feet deeper. About 4,000 cubic feet of mud had been removed from the center dam, but it was found impossible to complete the south dam with Oregon pine piles owing to the presence of stones and other obstructions below low water. Hardwood sheet piles were substituted and it was expected the dam would soon be completed. Another year will have passed ere the new Garden Bridge is completed. The Chekiang-rd Bridge is presenting several difficulties. First there was not sufficient sheet piles, and at the time of the report there were 25" water (pumping) in the north dam, while gas and water mains obstructed pile-driving. Meanwhile the closing of the bridge was causing great inconvenience to thousands of people daily. In the Settlement practically all the tram poles had been *planted*. The track work had been completed in most of the roads and the laying of the junction and curves at the corner of The Bund and Nanking-rd about completed.

STREET RAILWAY AND ELECTRIC LIGHTING PLANT, VLADIVOSTOK.—Consul Roger S. Green, referring to his recent report in regard to the improvements planned at Vladivostok (see The Review for November, 1906) now writes to Washington that the municipality has determined to undertake by itself the construction of the electric street railway and light and power plant. No definite project has yet been adopted, but an engineer is engaged upon plans and estimates. The present intention seems to be not to give the contract for the whole to one firm, but to buy the necessary material from a number of different parties. Persons interested in any kind of street railway and electrical supplies, from dynamos and rails to patent fare registers, etc., should therefore send at once catalogs to the Mayor of Vladivostok, and catalogs with price and other pertinent information either by their own representative or to some local house. Certain material is wanted at once, *viz.*, (1) rails (Phoenix type, with groove for flange of car wheel), a small lot needed to lay on a section of the streets where a new paving is soon to be put down: two grades wanted: (a) rails weighing 42.4 kilograms to the meter, quantity required, 2,455,616 lbs. If this weight can not be supplied, rails weighing up to 45 kilograms to the meter may be substituted: (b) rails weighing 33.5 kilograms to the meter, quantity required, 794,464 lbs. If not obtainable, rails weighing up to 35 kilograms per meter may be substituted. (2) closed cars, having 18 or 20 seats inside and standing room for six persons on each platform, with two motors, each of 20 h. p. and adapted to direct current of 500 volts.

## RAILWAYS AND RAILWAY SUPPLIES

IPOH-TRONOH (F. M. S.) LIGHT RAILWAY.—The light railway now being constructed from Ipoh to Tronoh is estimated to cost $1,000,000.

KIANGSI RAILWAY.—A Belgian syndicate has negotiated a 6 per cent loan of Tls. 4,000,000 for the Kiangsi Railway, between Kiukiang and Nanchang.

KOWLOON-CANTON RAILWAY.—The agreement of the Kowloon-Canton Railway has finally been signed and active construction should progress rapidly.

KIRING-CHANGCHUN RAILWAY.—Russians are trying to compete with the railway between Kirin and Changchun by dredging the River Sungari and giving better facilities on that waterway.

RAILWAY OPIUM TRAFFIC, CHINA.—The British Minister at Peking and the Waiwupu of the Chinese Government are reported to be conducting negotiations on the import of opium over the Tientsin-Chinkiang Railway and the Burma-China Railway.

TARLAC (P. I.) RAILWAY.—The Tarlac Railway Company is progressing rapidly in the construction of its line in North Luzon. Five miles of the railway are already in operation, and both passenger and freight traffic over the completed section augur well for the future of the road.

LIGHT STEAM RAILWAY, JAPAN.—A light steam railway is projected to run from Nagasaki, to Shimabara, a port on Shimabara Bay, opposite the Port of Misumi a distance of 26 miles, costing in its construction $325,000 gold. Catalogs of materials should be sent to the Mayor and Chamber of Commerce of Nagasaki.

SOUTH MANCHURIA RAILWAY.—Vice-president Nakamura, and other officials of the South Manchurian Railway, are busily engaged in negotiating with the military authorities for the transfer of the railway, which will take place at the end of the coming March. From April the company will start the work of widening the present gauge of the line.

URGA-SUNGARI RAILWAY.—A Peking dispatch states that as the result of negotiations carried on between Viceroy Yuan Shihkai and the Minister for Urga in the Department of Posts and Telegraphs, the Chinese Government has decided to construct the Urga-Sungari Railway, appropriating $500,000 from the proceeds of the Peking-Hankow and Peking-Tientsin railways as a starter fund.

TIBET ROPEWAY COMPANY, LTD.—A concern has been formed under the name of *The Tibet Ropeway Company, Ltd.*, for the purpose of carrying goods by means of a wire-rope tramway at a lower cost and much quicker than they can be transported in any other way from India into Tibet. The company's prospectus says that a concession has been secured from the Government of India, and the details given of the estimated expenditure and revenue indicate a return of 20 per cent dividend on the undertaking, even on the basis of present trade, which, with improved and cheaper transport, will be sure to expand almost immediately.

SHANGHAI-KASHING RAILWAY.—Work on the construction of the Shanghai-Kashing Railway has begun outside the Great South Gate of the Shanghai Native City. The Kingsu Railway Company will construct this line the route of which will be from outside the Great South Gate to Fengchingchen on the Kiangsu-Chekiang border, a distance of about 35 English miles. From Fengchingchen westward the Chekiang Provincial Railway Company will take up the work and connect the line with the City of Kashing and thence to the capital of the province, Hangchow. This railway is considered to be a very important one to the trade interests of this section of China.

EASTERN SIBERIAN RAILWAY.—M. de Lobel, a French noble, in consonance with the Russian Court Party, has secured the right to construct the Eastern Siberian Railway. The line will be constructed both from the western terminus of the Siberian Railway and Behring Strait to connect with the Behring Strait Railway, the underground line proposed by an American syndicate from Alaska. M. de Lobel is said to be working for the syndicate. The terms of the agreement with the Russian Government are the payment to the latter of 200,000,000 roubles, the continuance of the concession for 93 years and the privilege of working the numerous mines in the region the line will tap.

SEOUL-FUSAN RAILWAY.—The report of the Seoul-Fusan Railway Company for the first half of the year 1906 gives the following particulars of the company's affairs at the close of that period:—Government subsidy -Y-[illegible],000; cash transferred from Reserve of the Seoul-Chemulpo section, -Y-107,352.30, and cash transferred from the Reserve for equalizing dividends, -Y-1,780.70, making a total of -Y-550,123. Of this sum -Y-109,133 is appropriated to make good the losses sustained; -Y-450,000 is paid to shareholders as an interim dividend at the rate of 6 per cent *per annum*. The price of the company's shares now stands at -Y-94. After the railway is sold to the Government the amount to be realized per share by shareholders will be -Y-39.30 setting off the expected expenses incurred in the liquidation and repair work.

CANTON-HANKOW RAILWAY.—Mr. A. E. Smith, American Consul at Victoria, B. C., reports that a current among the Chinese of that city that $50,000,000 have been raised—largely in Canada and the United States—for the construction of the Canton-Hankow line. The principal promoter in Canada is a Chinese known as Charlie Yip Yen, long a resident of British Columbia. In company with others he has traveled largely over the United States and Canada, and everywhere has been successful in raising funds for this project. Four million dollars of the capital were subscribed by Chinese residents of Vancouver, Victoria, New Westminster, Montreal, and other points in Canada, while many more millions have been subscribed by Chinese living in New York City, Chicago, San Francisco and other cities of the United States.

CHINESE RAILWAYS.—Loans so far arranged for China for railway construction, are detailed by Mr. George Jamieson in a financial article dealing with foreign investments in Chinese railway loans. They are all guaranteed by the Imperial Government of China and are further specifically secured by a mortgage on the particular railway in respect to which they are issued. The loans are as follows:—British 5 per cent (£2,300,000) on the Peking-Shanghai-Kuan line; Belgian 5 per cent (Fes. 112,500,000), on the Peking-Hankow line; Russian 5 per cent (Fes. 40,000,000), on the Chengtu-Tungyuenfu line; Belgian 5 per cent (Fes. 40,000,000) on the Kaifeng-Honanfu line; British 5 per cent (£800,000 issued to the Peking Syndicate, Ltd.), on the Taiekow-Chinghua line; British 5 per cent (£3,250,000), on the Shanghai-Nanking line; British 5 per cent (£21,500,000 about to be issued), on the Canton-Kowloon line.

SWATOW RAILWAY.—The official report of the Swatow Railway, China, which has been published, confirms the main indictment, according to the *North China Daily News*, which everyone with eyes in his head has been able to bring against the work—the insufficiency of the mud embankment, and sand patching and failure to stand the onslaughts of the tropical rains which are common there. In some places the sleepers float on a bed of sand. The report forecasts the opening of three other stations, and the building of a depot at Swatow. Attention is also called to the large number of Japanese employed first of all in the construction, and now in the management of the railway; but notices that some Chinese have been sent to Formosa to learn the railway business. Five thousand six hundred dollars (Mexican) are given as the daily receipts, and a raise of $1,000 a day as soon as the freight traffic is opened, is forecasted. At present there is a persistent rumor that the line is being run at a loss.

RAILWAY IN SZECHUEN.—A telegram from Berlin published in the *South China Morning Post*, announces that China has given her consent to the construction of a railway line in the Province of Szechuen, and that two cities in this province are to be opened to trade. Szechuen, of which the provincial capital is Chingtu, has an area of 166,800 square miles and an estimated population according to Chinese official data, of more than 67,712,800. It is one of the most populous provinces in China, and one of the richest in respect to minerals. The people will build their own railway and surveys have been conducted with a view to finding a practicable route for a railway to connect Burma with the Yangtsze region in Szechuen, and it is anticipated that a definite plan for such a line will, now that the Government sanction has been obtained to the introduction of the railway, shortly be launched. The French also desire to carry their Yunnan Railway to Chingtu, thus connecting the capital of French Indo-China with the Capital of Szechuen.

YUET-HAN RAILWAY.—The following significant notice has been published by Cheng Koon Ying, president of the Kwang-Tung Mercantile Administration of the Yuet-Han Railway Company, Ltd., dated at Canton January 21st, 1907:—"All materials of whatever description purchased by this railway company are to be paid in full on net price strictly free of commissions or returns. This has been already notified in the local papers. Owing to rumors to the contrary being recently in circulation, the undersigned begs to repeat this for the information of the public that in the event of any employé of this railway company who may fraudulently ask the dealer to invoice any goods at an excessive price or receive commissions etc., when once brought to light, he shall be heavily fined and severely dealt with. Any dealer transacting business with this railway company who facilitates any employé to commit such fraud, which amounts to a breach of faith, his name and the name of his firm shall be advertised in the papers and no more business shall be transacted with him or his firm by this railway company in the future."

SOUTH MANCHURIAN RAILWAY ORGANIZATION.—Mr. Luke E. Wright, American Ambassador at Tokyo, has transmitted to the Department of State at Washington a revised copy of the translation of an order by the Government of Japan relating to the organization of the South Manchurian Railway Company. The company is authorized by the order to engage in the traffic of the following railways:—Tairen-Changchun, Nankuanling-Port Arthur, Tafangshen-Liushutun, Tashichiao-Yingkou, Yentai-Yentai Coal Mine, Sukiatun-Fushun, Mukden-Antunghien, all of which must be changed to the 4′ 8.5″ gauge within three years from the date on which the company commences its operations. The company is authorized to engage in the following accessory lines of business:—Mining, especially the operation of the coal mines at Fushun and Yentai; water transportation; electrical enterprises, warehousing, etc. The total amount of the capital of the company shall be -Y-200,000,000, -Y-100,000,000 shall be furnished by the Japanese Government, and shares now owned by the Government shall be open to subscription by Japanese and Chinese subjects. The company will have its head office at Tokyo and its branch office at Dalny.

## PUBLIC AND PORT WORKS, DOCKS, WHARVES, ETC.

TSINGTAU IMPROVEMENTS.—The budget of the German Colony of Tsingtau for 1907 provides for the expenditure of 2,300,000 marks on harbor improvements and 1,000,000 marks on the construction of roads, etc.

BRIDGES AT CANTON.—The Canton River Bridge Company, Ltd., is the name of the newly-organized concern with a capital of $1,000,000 that will undertake the construction of three bridges across the river at Canton. The bridges will be 75′ high from the water level and the first structure will be erected near Yaulan-mun. The company's offices and workshops are on a site near the beach.

TARLAC (P. I.) DYKE.—The Philippine Commission has authorized the expenditure of ₱20,000 out of the United States Congressional Relief Fund, or as much as may be necessary, for the Tarlac dyke, in the municipality of Tarlac, Province of Tarlac, North Luzon, from the site of the old Government building to a point 600′ beyond the conjunction of the Tarlac-Victoria-rd and the Tarlac railroad station.

WATERWORKS FOR VLADIVOSTOK.—The question of a waterworks system for Vladivostok is soon to be taken up for consideration. It is suggested that manufacturers of supplies which will be required for such an undertaking make arrangements with some local firm to keep in readiness the necessary information so that when the favorable moment comes prices can be obtained by telegraph and a definite proposal submitted without

NANNING IMPROVEMENTS.—The land to the south of Nanning, where the Chinese Imperial Maritime Customs and European godowns, etc., are to be located, is being levelled off and laid out in fine roads. A stone wall will be built along the riverfront for several hundred yards, which is giving a striking appearance to this far-inland river port. Over 300 workmen are engaged at the present time, at an average wage of 25 cents (Mexican) per day, rice included.

ROAD CONSTRUCTION, PAHANG.—The first instalment of $50,000 has been appropriated by the Government of the State of Pahang, F. M. S., for the Bentayan section of the main trunk road from the Ulu Pahang to the east coast. A cart road will be constructed from Bentayan, a point on the Pahang trunk road 16 miles from Kuala Lipis, to Kuantan. This will be a large undertaking as road-building, the distance being estimated at 150 miles. The line of this road will pass through some of the richest agricultural and mineral lands in Pahang.

SINGAPORE HARBOR IMPROVEMENT.—According to the *Singapore Free Press*, it is estimated that between 3,000 and 4,000 gals. of Jodelite will be used by the contractors, Sir John Jackson, Ltd., for treating the timber to be utilized in connection with the improvements of the Singapore Harbor. The contractors have used this preservative for similar work in many parts of the world and its efficacy in thoroughly protecting any kind of timber against the attack of white ants, worms, dry rot and decay is no longer in doubt.

MUNICIPALITY WATER SUPPLY, MANILA.—The two tunnels of the new water supply main, now being constructed at the headwaters of the Mariquina River for the city of Manila under the supervision of Major Case, Chief Engineer of Sewer and Waterworks Construction, have been connected and the tunnel is now complete. All that now remains to be done is the laying of the 42″ pipe which shall conduct the water from the new dam to the city. The tunnel connects the dam, 30′ by 400′ in length on the crest, which closes the gap in which 2,050,000,000 gals. of reserved water are to be held in readiness for Manila's use. The tunnel is fast being completed, 1¼ miles being already finished.

PENANG HARBOR IMPROVEMENTS.—The new boat pier which is included in this scheme has been completed and has been brought into use, one beneficial feature being the introduction of large self-propelling cranes which it had been impossible heretofore to use. A new import pier, well equipped with electric cranes capable of dealing with 2,000 tons of cargo per day, will soon be started. The pier will lead to a new Customs shed with an area of 80,000 square feet. The new dredger *Trieton*, purchased from Ceylon, is working satisfactorily. All the berths in the harbor have been dredged now and have a depth of 28′ at low water. New low-level passenger piers have been completed. The new extension works in connection with the widening of the northeast entrance with a protecting pier are progressing and it is contemplated will be completed in 1910.

PUBLIC WORKS APPROPRIATIONS, PHILIPPINE ISLANDS.—The Philippine Commission has made appropriations for public works and permanent improvements, as follows:—For the extension of the water supply system at the Culion Leper Colony, ₱10,000; for the purchase of land adjoining the Exposition Grounds Manila, ₱21,028.75; for the purchase, from settlers, of improvements and rights to land required for the Iwahig Penal Settlement, ₱1,079.80; for the construction of necessary hospital buildings and their permanent equipment, for the Bureau of Prisons, ₱100,000; for the construction of buildings and their permanent equipment on the San Lazaro Hospital grounds, to provide for the care of 250 additional insane persons, ₱55,000; for the construction of provincial schoolhouses, to be allotted by the Secretary of Public Instruction, ₱300,000; for the construction of Constabulary barracks and quarters, ₱100,000; for the improvement of the trail through the mountains, connecting the completed Cebu, Toledo-rd. ₱5,000; for the reconstruction of retaining wall and wharf along the Pasig River at Malacañan, and alterations in the Governor-General's residence, ₱15,000; for grading grounds pertaining to the buildings occupied by the Bureau of Science, Manila, ₱4,060; for the construction of a residence for the Governor-General, at Baguio, Benguet, ₱30,000; for the construction of a building for the employés of the Bureau of Public Works, at Baguio, ₱5,000; for the expenses of investigations in regard to the improvement of the Port of Manila and other harbors, ₱5,000; for the construction of abutments for two wharves at the Port of Manila, ₱15,000; for the completion of the Luneta Extension fill, ₱134,306; for the construction of a sewer system for Bilibid Prison, Manila, ₱20,000; for permanent, sanitary beds for inmates of Bilibid Prison, ₱20,000; for the payment of expense of construction of warehouses at the Iwahig Penal Settlement, ₱1,700. The unexpended balance of funds for the completion of the road from Baguio to Trinidad, Benguet, is made available for expenditure as road and bridge funds for the Province of Benguet. Total appropriations for all purposes, ₱835,472.50.

## SHIPBUILDING AND GENERAL MARINE MATTERS

OSAKA SHOSEN KAISHA.—The result of the workings of this company for the latter half-year of 1906 was unsatisfactory and no dividend will be paid for the period.

OSAKA SHOSEN KAISHA.—This steamship company intends to build two steamers of about 10,000 tons each with a view to opening a regular service between America and Japan.

LAUNCH OF STEAMER "EMERAUDE," HONGKONG.—The *Emeraude*, the second of four stern-wheel steamers built or building at the Hunghom establishment of the Hongkong and Whampoa Dock Company, has been successfully launched.

HONGKONG AND WHAMPOA DOCK COMPANY, LTD.—Subject to audit, the directors of this company will recommend at the forthcoming annual meeting of shareholders a dividend of 12 per cent, equal to $6 per share; pass $50,000 to Special Account and carry forward about $393,000.

STEAMER "BAN HONG LONG."—The trial trip of the steamer *Ban Hong Long*, the latest addition to the Singapore-Bangkok line, took place recently. The steamer was built on order of Messrs. Howarth Erskine, Ltd., of Singapore, and is essentially a cargo boat with a net register of 709 tons. She is capable of carrying 1,400 tons of cargo. She is owned by Mr. Low Kiok Chiong, of "Chop" Ban Hong, and on her trial trip she covered the measured mile at a mean speed of 11.387 knots.

NEW HOLT LINER "TITAN."—The new liner *Titan*, which arrived in the Far East recently from Liverpool on her maiden voyage, was built in 1906 for the Ocean Steamship Company, Ltd., by Messrs. D. and W. Henderson & Co., of Glasgow. She is sister ship of the *Cyclops* and *Bellerophon*, and about 9,000 tons gross. Her holds have seven compartments for heavy machinery and bulky goods. She has no masts or sails. There are four tall, powerful posts which act as derrick-posts, and hold ventilators two abreast, fore and aft.

MITSU BISHI DOCKYARD AND ENGINE WORKS, NAGASAKI.—Mr. H. Shoda, General Manager of the Mitsu Bishi Dockyard and Engine Works, has been transferred to the head office of the company at Tokyo, and been succeeded by Mr. H. Maruta, Assistant General Manager. The new General Manager spent some years in England studying shipbuilding and was a long time at the Mitsu Bishi Dockyard and Engine Works as Works Manager. When the Kobe yard was opened in 1905 he succeeded Mr. R. Midzutani as Assistant General Manager at Nagasaki, and has now reached what must be considered one of the most important positions in the Japanese shipbuilding world.

CAPE VARELLA WRECKS.—The Hongkong and Whampoa Dock Company's powerful tug *Robert Cooke*, and the Norddeutscher Lloyd's steamer *Wong Koi*, are still high and dry on Cape Varella beach. The tug is lying alongside the steamer and is full of water from the waves that have been continually rolling over the vessel. As far as is known there are no holes in the plates of the tug's hull. Hope of saving either stranded vessel has about been abandoned. In spite of the great inconvenience the Hongkong dock company is put at on account of the stranding of the *Robert Cooke*, its floating plant is equal to all emergencies. The powerful launches *K6* and *K7* have been called into service to replace the tug. These are being assisted by the auxiliary vessels *Edith* and *C1*. The *K7*, a new boat, has already done excellent harbor duties.

SEATTLE-CHINA STEAMSHIP SERVICE.—It is announced that North China ports are to have direct communication with Seattle. Messrs. Frank Waterhouse & Co. and Andrew Weir & Co. have arranged to begin jointly the operation of the new line immedately, using six steamships carrying from 5,500 to 12,000 tons, the latest type of the ocean freighter. A regular service is to be given between Puget Sound ports, British Columbia and Hakodate, Vladivostok, Dalny, Chefoo, Taku Bar and Newchwang, calling either way at Chemulpo, Chinampo and other Korean ports, when the inducement warrants sending the vessels there. The vessels to be used on this run are the *Gymeric* (6,200 tons), the *Boveric* (7,200 tons), the *Inveric* (7,200 tons), the *Aymeric* (8,200 tons), the *Sureric* (12,500 tons), and the *Quito* (5,500 tons). The *Sureric* and the *Gymeric* have been dispatched from Seattle and this (February) month the *Boveric* and the *Quito* are clearing. The *Inveric* is scheduled to sail in March. The *Sureric* and the *Boveric* were launched in 1906, and the *Gymeric* was put in commission in 1905. The *Quito* and *Gymeric* were built in 1900, and the *Inveric* in 1901.

KAWASAKI DOCKYARD COMPANY, KOBE.—At the recent general meeting of the Kawasaki Dockyard Company, a resolution was adopted to add to the company's business the manufacture of steam engines, railway carriages, tires, axles, electric motors, military arms and steel products, and an amendment to the Articles of Association covering the resolution was agreed upon. The net profits of the company for the last half-year amounted to -Y-459,639, including a surplus of -Y-58,367. Of this sum -Y-50,000 has been placed to the Reserve Fund and -Y-20,000 to the Special Reserve for the depreciation of building and machinery. -Y-226,000 was set aside for dividend, and -Y-56,800 for extra dividend, making a total dividend 12.56 per cent *per annum*. -Y-20,000 was devoted for bonuses to officials the balance being carried forward.

## MINING, MINERALS AND THE METAL TRADES

OIL IN SIAM.—Petroleum is found in Muang Fang in the extreme north of Siam. Oil is also reported in Kedah. Siam petroleum is black in color and very viscous. It is supposed that the occurrences are geologically connected with the oil-fields of Burma.

KELANTAN GOLD DREDGING COMPANY, LTD.—This company has gone into voluntary liquidation with Mr. Cecil James Barnes, of 15 George-st, Mansion House, London, as liquidator for the purpose of winding up the business.

GOLD IN MINDANAO, P. I.—Gold in paying quantities has been discovered near Zamboanga, the capital city of the Moro Province, Philippine Islands. Surface washings show good returns in the mountains nearby. Several American miners are now prospecting the country.

AMERICAN MINING PROJECT, SIBERIA.—Mr. Lebedeff, a mining engineer, who has been engaged by a group of Russian and American capitalists and engineers, has found at the source of the Biryussa and other rivers of the Nizhneoudinsk District a vein of gold and copper manganese ore.

PETROLEUM PRODUCT OF JAPAN.—The petroleum produced in Japan is only sufficient to meet a quarter of the demand in the Empire, the remainder being supplied by Russia and America. The value of the oil imported amounts to about -Y-16,000,000 *per annum*, of which -Y-10,000,000 represent Russian oil and -Y-6,000,000 American oil.

CHINA AND MANCHURIAN COAL-FIELDS.—The Chinese Government has again demanded that the Japanese return the Fushun and Yentai mines to Chinese control in April next, the date on which the Japanese agreed to withdraw all troops from Manchuria. The Chinese also demand the return of the Penchihu mine now being worked by the Japanese firm of Okura.

MACHINE OIL WORKS, EAST BORNEO.—It was recently announced that the Royal Langkat Petroleum Company intended to establish extensive machine oil works at Singapore, but now that the owners have obtained a controlling interest in the Shell Company, another idea finds favor, and the works will be established in East Borneo on the concession of the Shell Company.

WEIHAIWEI GOLD MINING COMPANY, LTD.—At a recent extraordinary general meeting in Shanghai, the stockholders of this company adopted a resolution to the effect that it having been proved to the satisfaction of the shareholders that the company could not by reason of its liabilities continue in business, the company would voluntarily wind up the concern. Mr. Louis Rudolph Burkhardt, of Shanghai, was appointed liquidator.

SIAMESE TIN SYNDICATE, LTD.—This company has been registered in London by Messrs. Francis & Crookenden, 3 New Square, Lincoln's Inn, W. C., with a capital of £120,000 in £1 shares. The object of the company is to acquire mining claims, licenses, leases, concessions and rights, mill sites and water, petroleum and other rights and properties in Siam or elsewhere, and to carry on the business of tin and general miners, explorers, metallurgists financiers, promoters, etc.

KINTA TIN MINES, LTD.—At the sixth annual general meeting of the Kinta Tin Mines, Ltd., held recently in London, it was announced that the production of ore on this property increased during the year under review from 2,988 piculs to 3,238 piculs, and the average price obtained was better by $3.76 per picul, resulting in an increase of $23,764. The net profit was £15,247 3s 5d. Against this interim dividends amounting to 17 per cent were paid, and a final 2½ per cent for the year.

AUSTRALIAN GOLD PRODUCTION AND EXPORTATION.—Australia's gold production for the eight months ended August 31st, 1906, amounted, approximately, to 2,306,532 fine ounces, of the value of about $47,704,840 gold, against 2,388,044 fine ounces, of the value of about $49,390,105 for the corresponding period in 1905. The net decrease was 81,512 ounces. Increases are shown by Victoria and New South Wales and decreases by Queensland and Western Australia. The shipments of gold during the first nine months of 1906 show an increase of $28,366,531 gold over those of the corresponding period of 1905.

MINING IN SHANSI.—The Office of Mining Affairs at Hsianfu has, through the medium of the Chinese Minister at Tokyo, engaged an experienced Japanese mining engineer for a period of one year, for the working of the rich petroleum oil mine in the District of Yenchanghsien. The sanction for working this mine was obtained some time ago from the Throne. Besides the engineer six other Japanese have been engaged in connection with the mine's development, and the foreign party has arrived at Yenchang to begin operations. This mine is said to have been discovered by a European engineer several years ago, and his request made of the Chinese authorities at the time for permission to work the property was refused.

HEILUNGCHIANG GOLD MINES.—These mines, which ever since the Boxer trouble have been in the hands of the Russians, are to be handed back at cost to China. In this connection a Chinese Taotai, who has been appointed superintendent of the mines in question accompanied by eight interpreters and assistants, 20 miners from the Kaping Colliery and a regiment of armed troops, left Tientsin for Hailungchiang Province, *via* Mukden, to take over the property. The party also took along 2,000 extra Mauser rifles with sufficient ammunition to arm two other regiments to protect the miners from lawless raids of Russian outlaws and Chinese mounted bandits. The mines are said to be exceptionally rich in the precious metal.

SILVER MINING, SOUTH CHINA.—Some years ago, says the *South China Morning Post*, a Chinese syndicate, with more capital than brains, started to exploit the Sam Cha silver mine in Kwai-Shen, which is about 300 miles from Wuchow. As no European mining expert was allowed to be employed, the enterprise turned out a failure. After an interval, a second syndicate was formed, but, owing to the same restrictions, it failed also. Over $1,000,000 are said to have been sunk in the venture, yet the mine is believed to be one of the richest in the world. Now the Taotai, at the request of the shareholders, has petitioned Peking to allow the services of a foreign expert to be retained, and this has been granted. A third syndicate has, therefore, been formed, and a contract entered into with a well-known eastern banking company to advance money to obtain the necessary plant for pumping, etc., the security being made up, the first and second companies being responsible for 25 per cent each of the loan, and the third the remaining 50 per cent.

SIBERIAN COAL AND IRON.—Large deposits of anthracite coal have been discovered in the Russian territory of the Orenburg Cossacks. The depth is only 56" and the vein extends about 133 miles north and south, and at about the same distance in a southerly direction from the great Siberian Railroad. The great value of this discovery lies in the following facts:—(1) The proximity of the coal fields to the Ural iron and steel industry, which is at present mainly dependent upon wood and charcoal for fuel, and therefore otherwise incapable of further expansion. (2) In view of the probable early exhaustion of the South Russian iron-ore mines, estimated to take place in about 30 years, the Ural District is destined to become the greatest producer of iron and steel in the Russian Empire; the above newly-discovered coalfields will therefore become of inestimable value to the district. (3) The discovery in the neighborhood of the coal-fields of deposits of brown hematite, an ore well adapted for smelting purposes.

## FINANCIAL AND MISCELLANEOUS

BANQUE DE L'INDO-CHINE BUILDING, BANGKOK.—Messrs. Howarth Erskine, Ltd., of Singapore, are erecting a magnificent building for the Banque de L'Indo-Chine, in Bangkok.

FLOUR MILLS, CHINA AND MANCHURIA.—The establishment of a flour mill at Hankow, China, and mills in Manchuria is under consideration.

ICE-MAKING ENTERPRISE, NAGOYA, JAPAN.—A scheme is on foot in Nagoya for establishing an ice-making concern, with a capital of -Y-300,000. The new venture will probably take up a cold-storage business in addition to the production of ice.

AMALGAMATION OF JAPANESE SPINNING COMPANIES.—Negotiations between the directors of the Kanegafuchi Spinning Company and the Nippon Silk Spinning Company with a view to the amalgamation of those concerns, are reported to be making favorable progress.

CHINA VENTURE SYNDICATE, LTD.—This company has been registered in London with a capital of £2,000, in £1 shares. It will carry on the business of financiers, company promoters, bankers, underwriters, concessionaires, contractors, miners, prospectors, etc.

FLOUR MILLS, JAPAN.—Many large flour mills have been projected in Japan. Those of the Imperial, the East Asia, and the Meiji Flour companies will most probably be located at Tokyo and it is estimated will, with other new companies, produce 3,000 sacks daily.

SUGAR INDUSTRY, FORMOSA.—Manufacturers of sugar machinery are watching developments in Formosa, where the sugar industry is growing rapidly. Within the next few years many large mills will be constructed. With the growth of this industry there will also be a demand for light railway materials.

YOKOHAMA STORAGE COMPANY.—This company required over -Y-8,000,000 capital in order to undertake reclamation work and the building of wharves capable of accommodating vessels of 25,000 tons. It is therefore considering either the acquisition of a loan from a German syndicate or the increase of its present capital of -Y-3,500,000 to -Y-10,000,000.

LAND RECLAMATION COMPANY, HONGKONG.—The company has declared a dividend of $7 per share, which will absorb about $33,000 of the balance brought forward from 1905. The directors of this company are Messrs. W. J. Gresson, Sir Paul Chater, A. J. Raymond, D. M. Nissin, Ho Tung, and Shellim. The auditors are Messrs. W. Hutton Potts and A. O'D. Gourdin.

EASTERN EXPLORATION COMPANY, LTD.—This company has been registered in London with a capital of £5,250, in 5,000 ordinary shares of £1 each and 500 deferred shares of 1s. each. Its object is to carry on in the United Kingdom, China and the Far East, and elsewhere, the business of explorers, financiers, agents, contractors, concessionaires, bankers, merchants, etc.

WEST POINT BUILDING COMPANY, LTD., HONGKONG.—The result of the workings of this company during 1906 show a net profit of $52,546.69, as against $45,700.76, for 1905, which enables the company to declare a dividend of $4.10 as against $3.65 for 1905. The new Board of Directors consists of Sir Paul Chater (chairman), Messrs. W. J. Gresson and A. J. Raymond. The Auditor is C. W. May.

CONCRETE BUSINESS BLOCK, MANILA.—The American Hardware Company, Manila, has purchased the Helios Cigar Factory site on calle Echague and will soon begin the construction thereon of a splendid reinforced concrete business block for its own accommodation. Manager Henry C. Jones promises that the new structure will be the finest commercial building of its kind in the Orient.

CHINA PROVIDENT, LOAN AND MORTGAGE COMPANY, HONGKONG.—This company pays a dividend of $8 per share on its business for 1906 and places $15,000 to Reserve. Dr. J. W. Noble and Messrs. J. S. Van Buren, H. P. White and Chow Hing Kee have been reelected to the Consulting Committee for the Current year. Messrs. A. O'D. Gourdin and W. Hotton Potts have been reelected auditors.

PHILIPPINE AGRICULTURAL BANK SCHEME.—The House of Representatives of the American Congress has received a favorable committee report on the bill to guarantee interest in the sum of $200,000 gold for an agricultural bank in the Philippines. Should the bill become a law it will admit of the establishment of a system of private agricultural banks, with an aggregate capital of $5,000,000 gold.

KOWLOON LAND AND BUILDING COMPANY, LTD. HONGKONG.—The balance of Profit and Loss Account for the year 1906, after writing off all charges and expenses, amounts to $16,639.15. A dividend of $2.50 per share has been declared, which, after writing of the directors' and auditor's fees leaves a balance of $1,089.15 to the credit of the new Profit and Loss Account. Messrs. A. Rodgers and W. H. Gaskell are reelected directors. Mr. C. W. May has been reelected auditor.

LEAD PAINT MANUFACTURE, JAPAN.—Owing to the remarkable increase in the demand for lead paint, the plant of the Japan Paint Company, of Tokyo, has proved inadequate to execute the orders received. This company recently commenced to make varnish, and has also discovered a new process for extracting lead from a certain ore for use as raw material in paint making. The Board of Directors has doubled the $250,000 gold capital and is extending the Osaka factory.

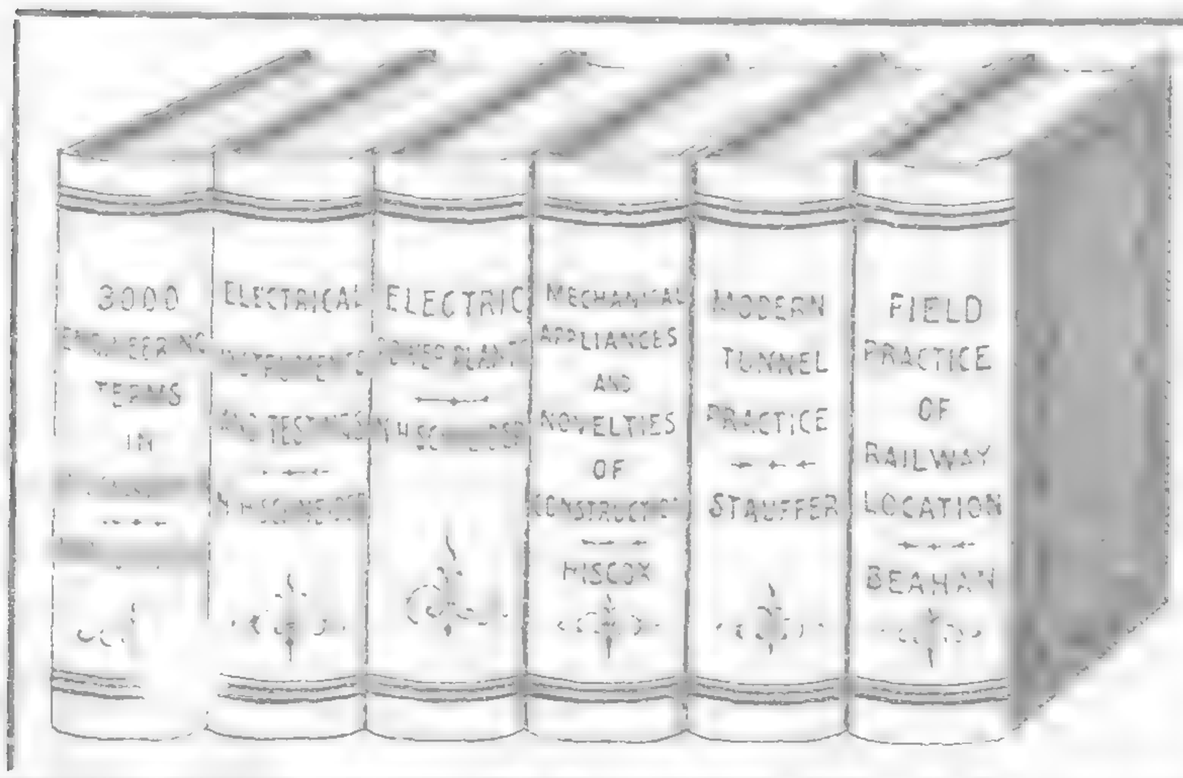
PRISON LABOR FOR PHILIPPINE PROVINCES.—The Philippine Commission has passed the necessary legislation authorizing provincial boards to cause all able bodied prisoners except such as are held as witnesses or awaiting trial, to work on any of the public roads or highways or other public works, or to clean, care for or repair public buildings or grounds in the province where such prisoners are confined. The prisoners will wear their prison garb and be under sufficient guard to prevent their making their escape.

WELL-BORING IN PAMPANGA PROVINCE, P. I.—Numerous artesian wells have been sunk in Pampanga Province recently. Eight wells have been drilled in the City of Pampanga. One in Bacolod with 115' of piping was drilled at a cost of P1,813, or an average of P15.77 per foot. In Guagua, Lubao, Macabebe, and San Fernando wells have also been drilled with success, the cost of those in the last-named place being the most expensive, averaging P24.10 per foot. The average cost of all the wells drilled in the province was P19.24.

JAVANESE LABOR MARKET.—The labor market for Javanese emigrants abroad shows a steady increase in demand. Hitherto Javanese coolies mainly went to the Straits Settlements, according to the *Penang Gazette*, and the Federated Malay States. Recently the *Java Government Gazette* contained a notification allowing coolies to be recruited there for planting and mining in New Caledonia, and for rubber cultivation in North Borneo and German New Guinea. The Manchester North Borneo Rubber Company alone got leave to recruit 300 coolies.

FORMOSA'S FOREIGN TRADE, 1906.—The Viceroy of Formosa has telegraphed to Tokyo the following figures with regard to the island's foreign trade in 1906:—Exports, -Y-9,386,170, a decrease of -Y-1,318,976 from 1905; imports, -Y-12,366,944, an increase of -Y-1,403,067 over 1905. The excess of imports over exports was -Y-2,980,774. Export of gold and silver -Y-2,181,729, an increase of -Y-952,673 over 1905; import, -Y-24,329, a decrease of -Y-430,732 from 1905. The excess of exports over imports was -Y-2,157,400. The total tonnage of ships entered was 316,203, an increase of 63,043 tons over 1905; of ships cleared, 311,850, an increase of 57,031 tons over 1905.

PHILIPPINE HEMP MACHINE COMPANY.—This company was organized in Manila recently with a capital of P150,000 ($75,000 gold), under the laws of the Philippine Islands. The incorporators are Messrs. M. A. Clarke, J. S. Gillies, Franklin G. Colby, Benito Legarda, John Gibson, M. L. Stewart, W. H. Anderson, John W. Haussermann, D. R. Williams, Frank A. Crowhurst, James F. Macleod and Charles A. Reynolds, and Major George P. Ahern. The company will promote the *Gillies Process* of extracting the *abacá* (hemp) fiber, as demonstrated by the Gillies machine. This machine will weigh about 200 lbs. when equipped for artificial power and about 100 lbs. equipped for hand-power. Mr. Gillies is now in the United States superintending the construction of the machines.




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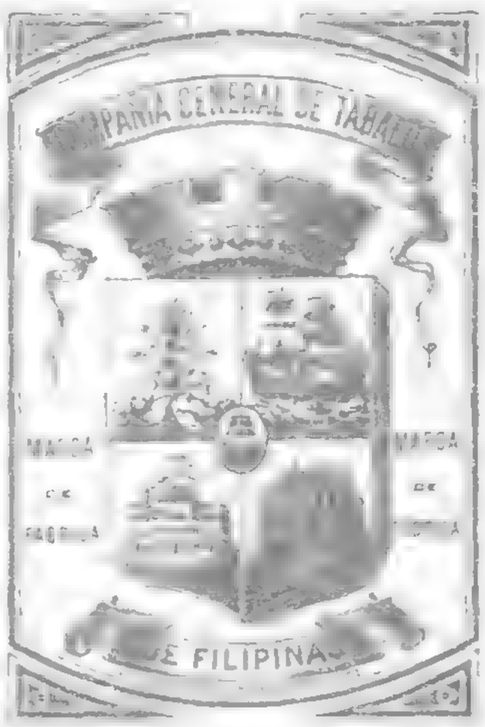
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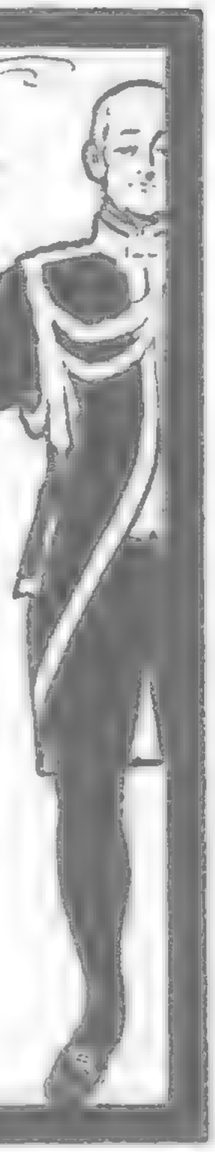
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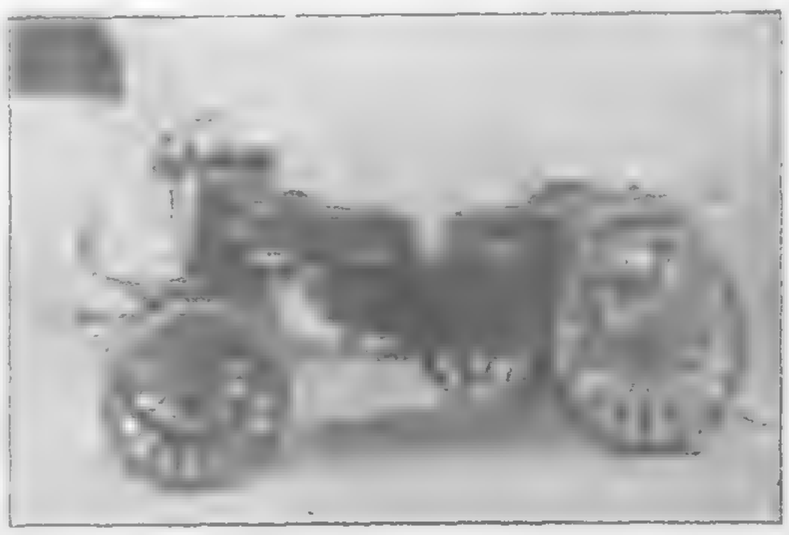
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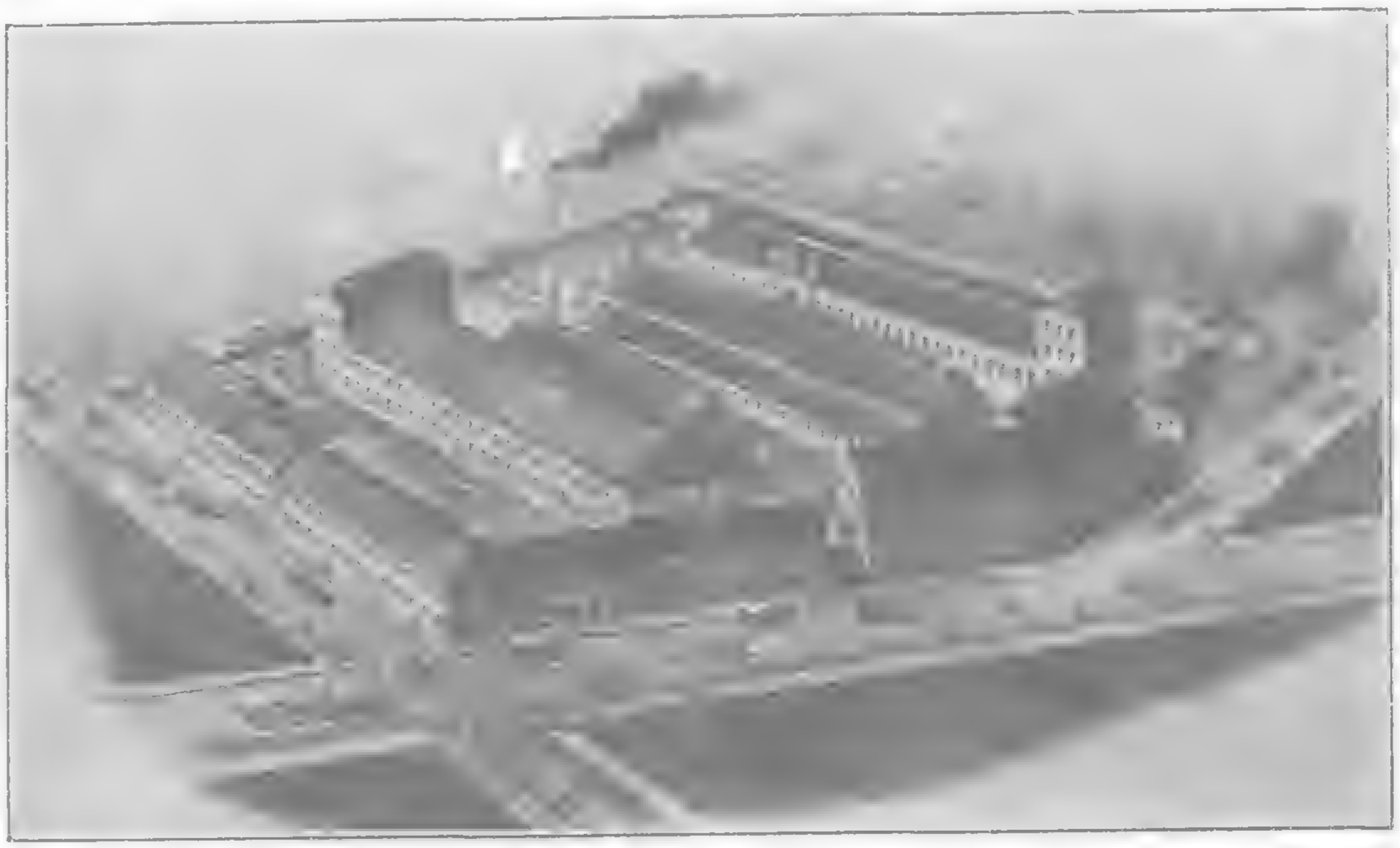
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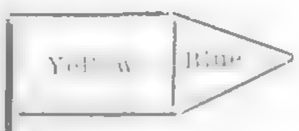
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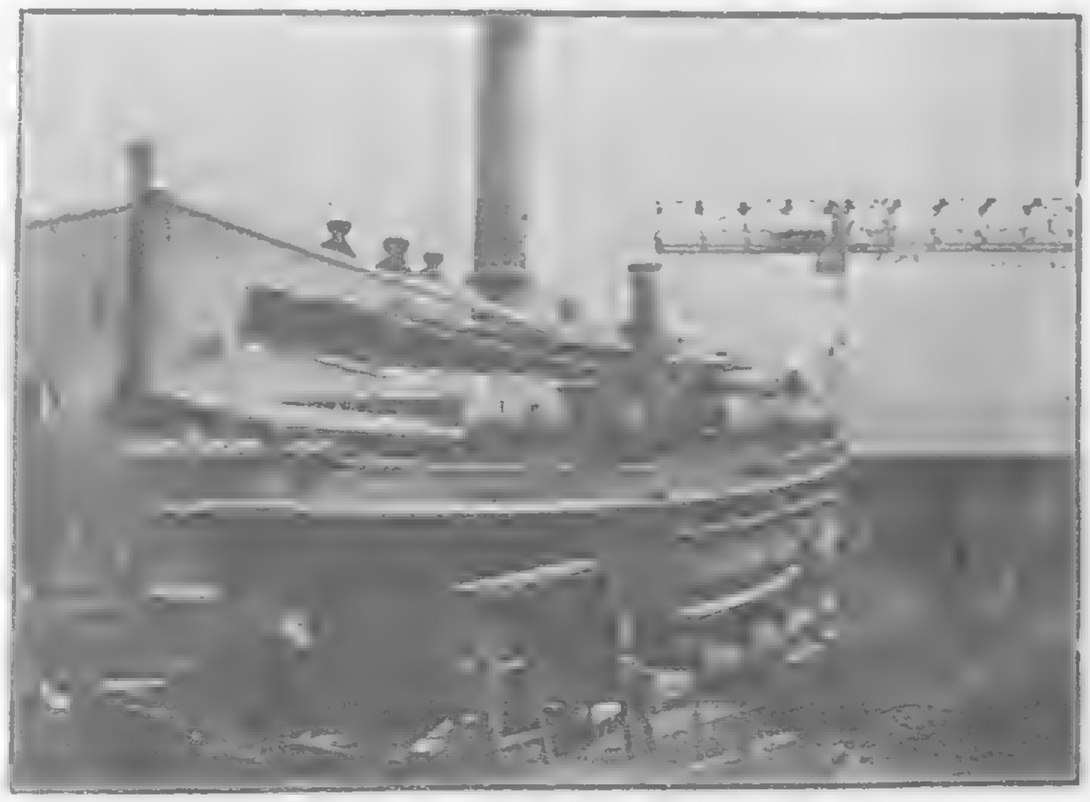
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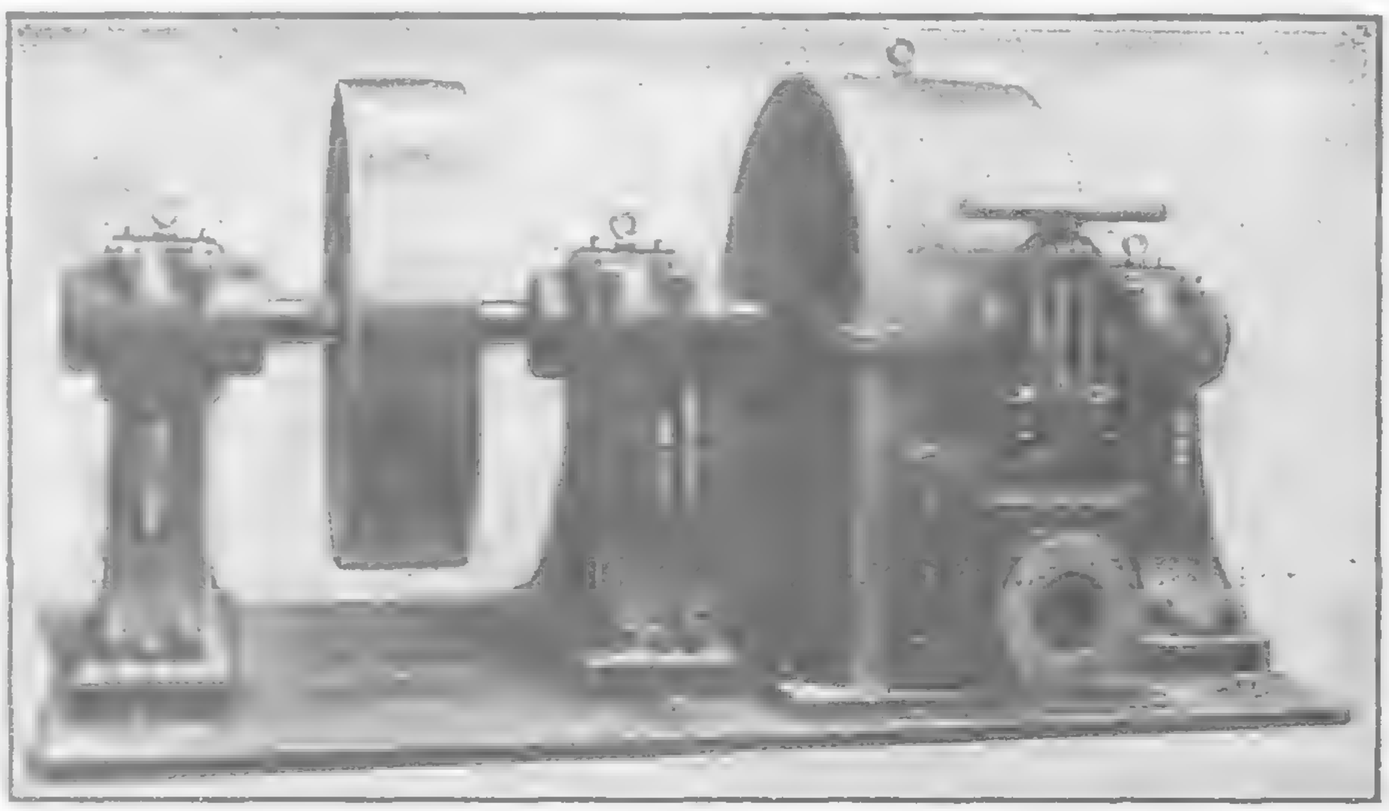
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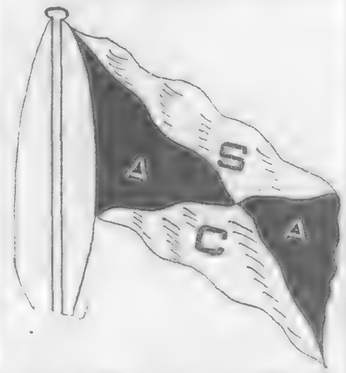
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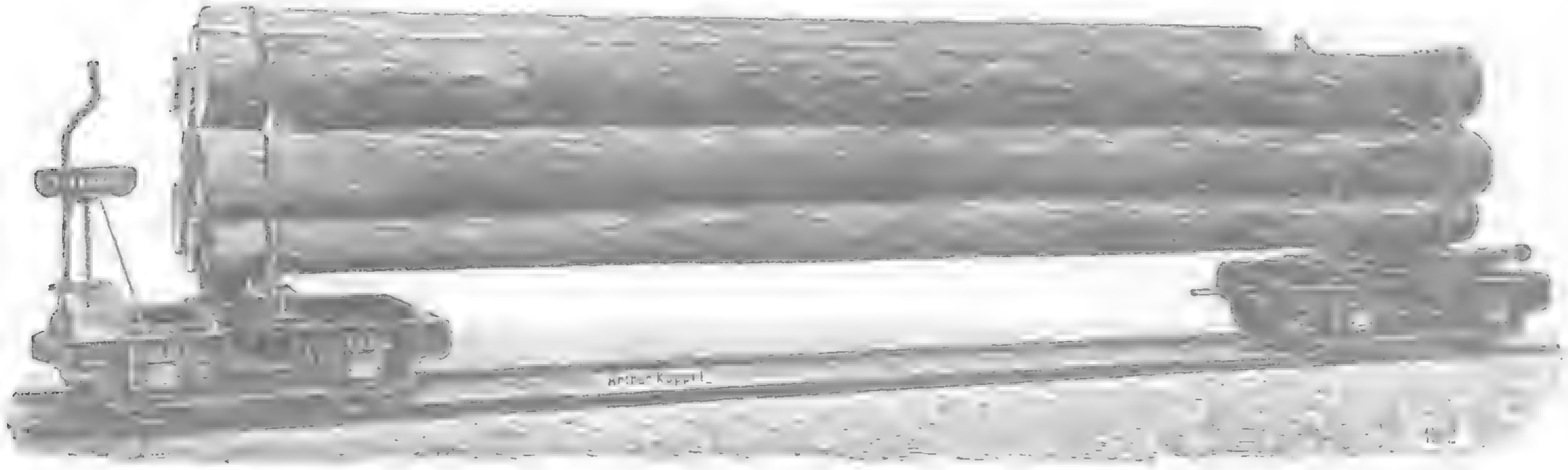
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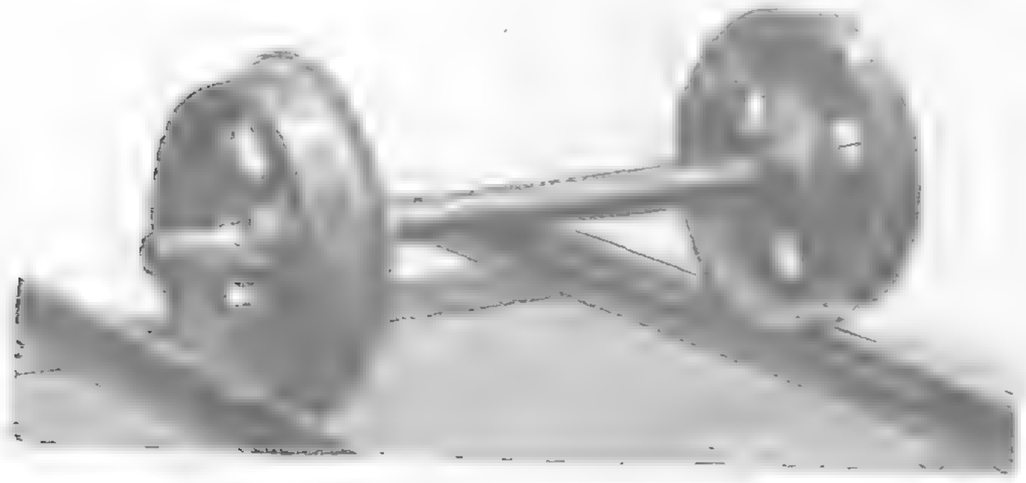
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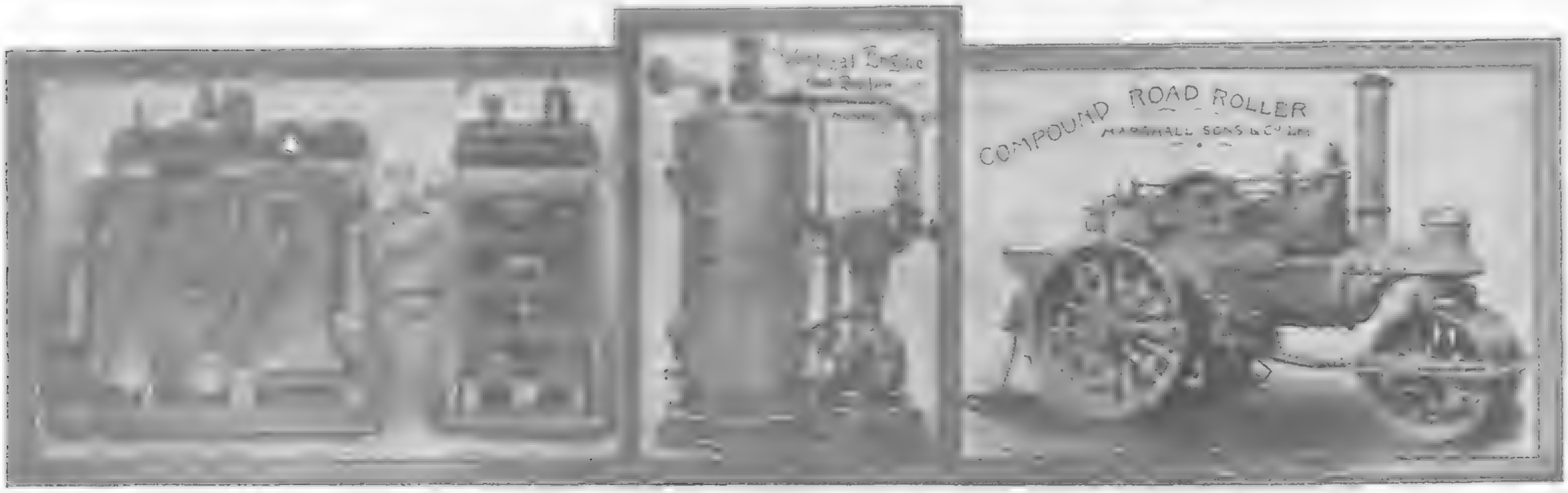
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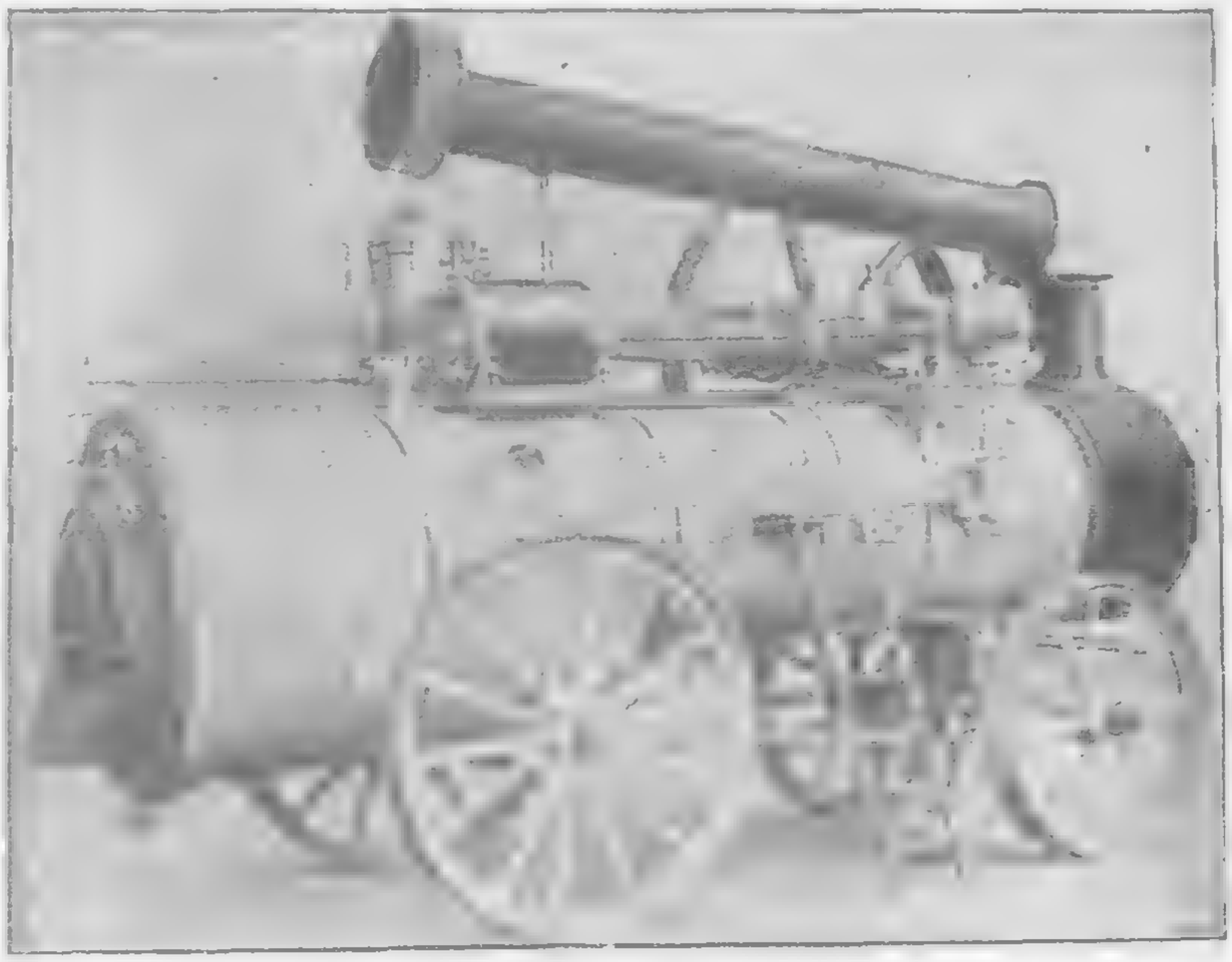
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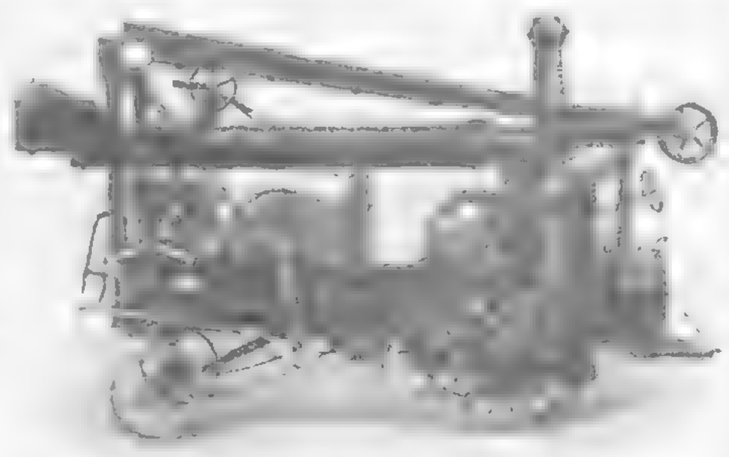
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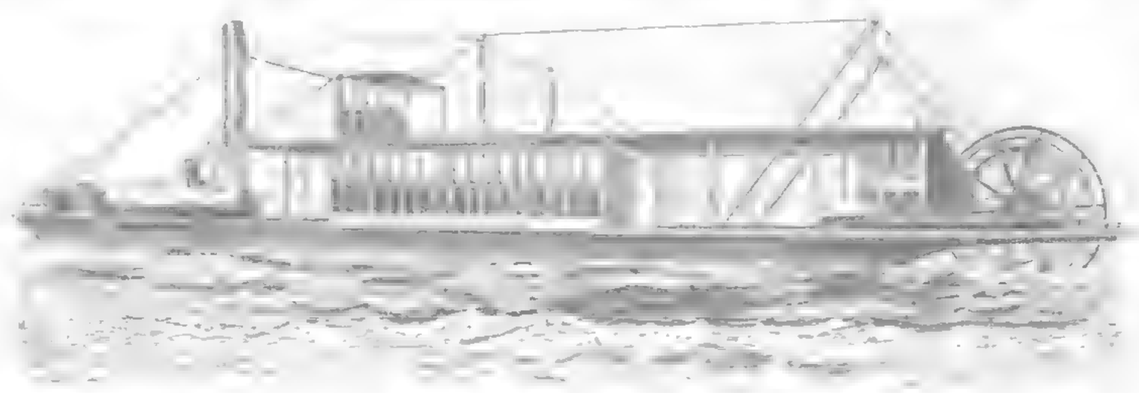
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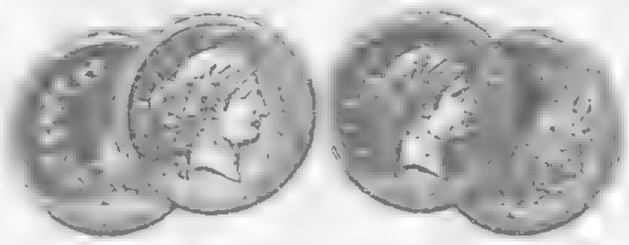
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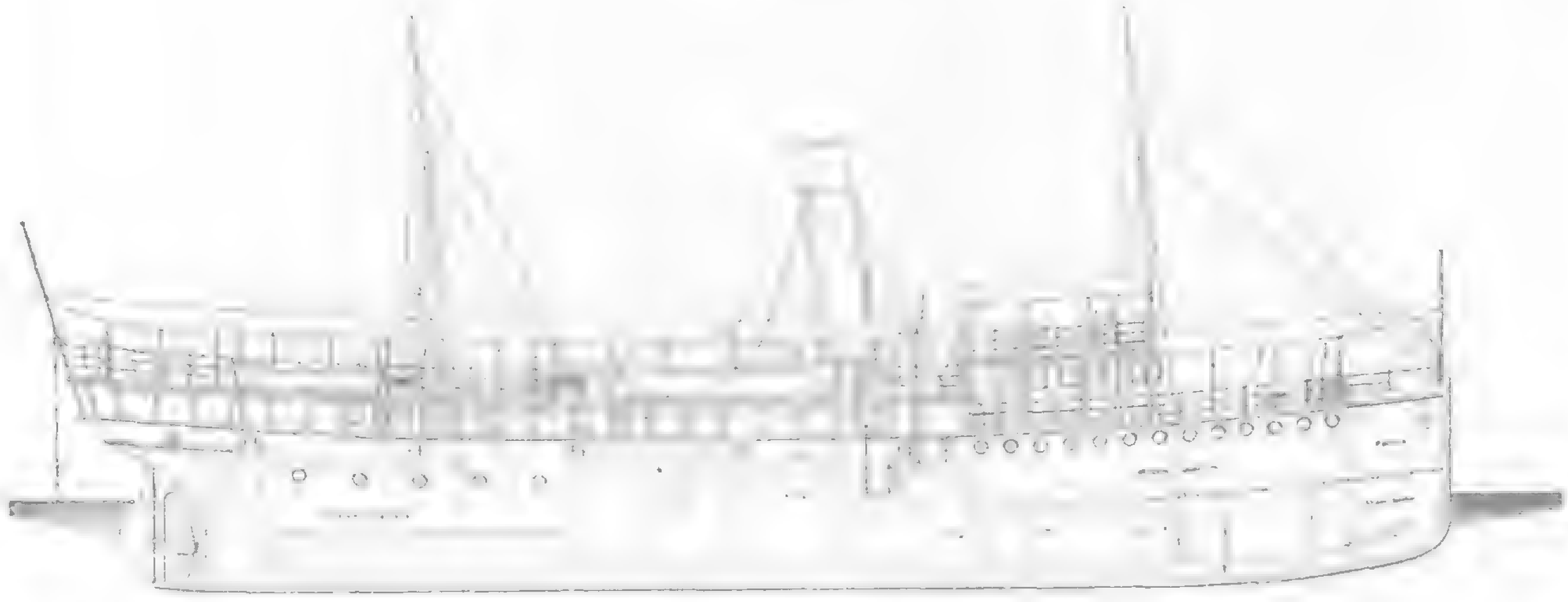
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|---|---|---|---|---|---|
| | | | | SPRINGS | NEAPS |
| **KOWLOON** | *Feet.* | *Feet.* | *Feet.* | *Feet.* | *Feet.* |
| No. 1 Dock, Kowloon | 576 | 86 feet top / 70 ft. bottom | 30′ | 7′ 6″ | 3 |
| No. 2 Dock, Kowloon | 371 | 74′ | 18′ 6″ | 7′ 6″ | — |
| No. 3 Dock, Kowloon | 264 | 49′ 3″ | 14′ | 7′ 6″ | — |
| Patent Slip, No. 1, Kowloon | 240 | 60′ | 14′ | 7′ 6″ | — |
| Patent Slip, No. 2, Kowloon | 220 | 60′ | 12′ | 7′ 6″ | — |
| **TAI-KOK-TSUI** | | | | | |
| Cosmopolitan Dock | 466 | 85′ 6″ | 20′ | 7′ 6″ | — |
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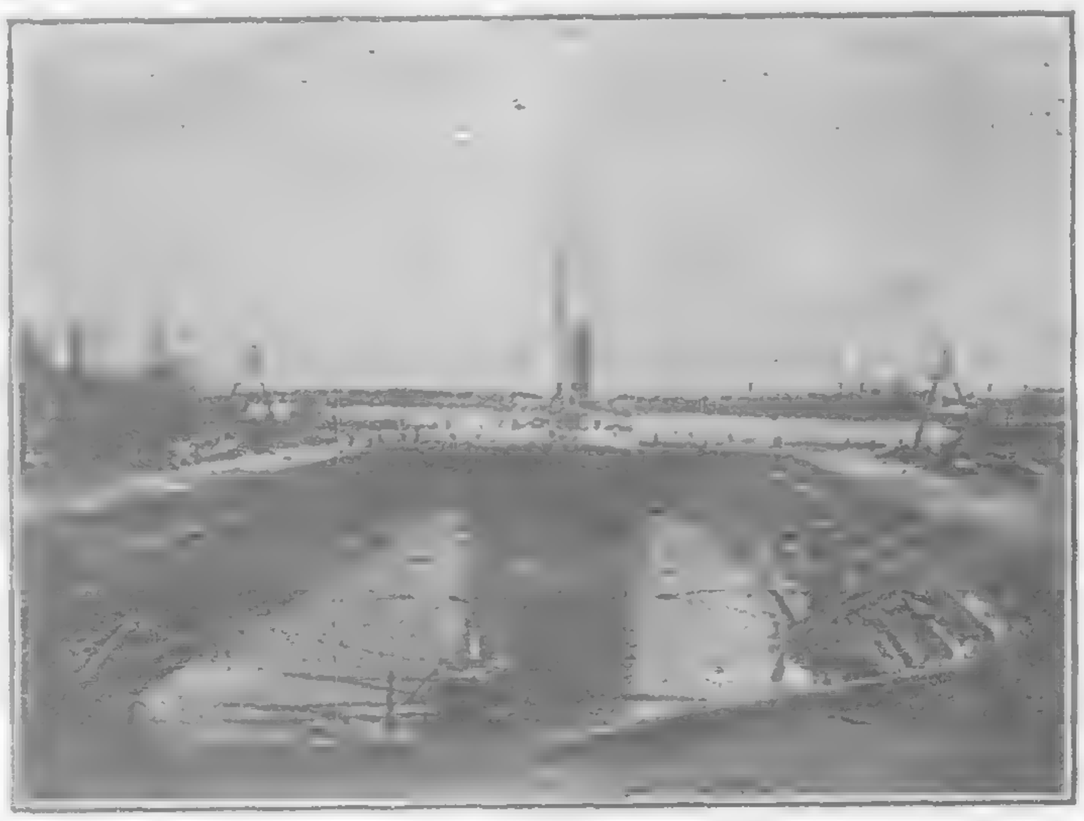
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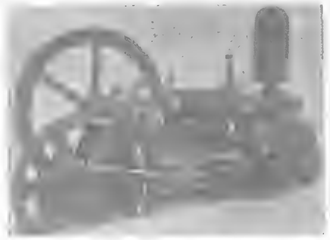
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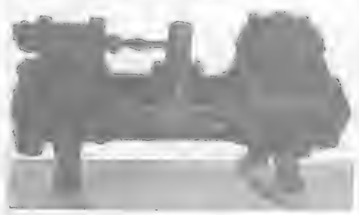
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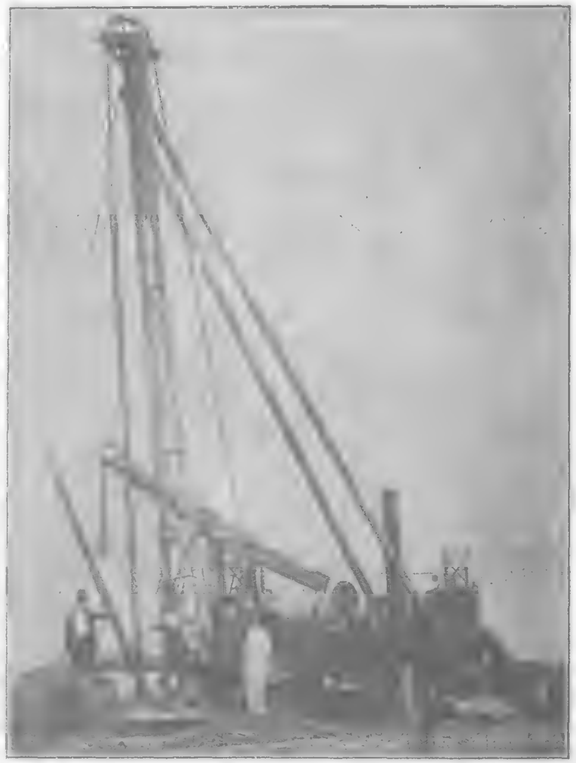
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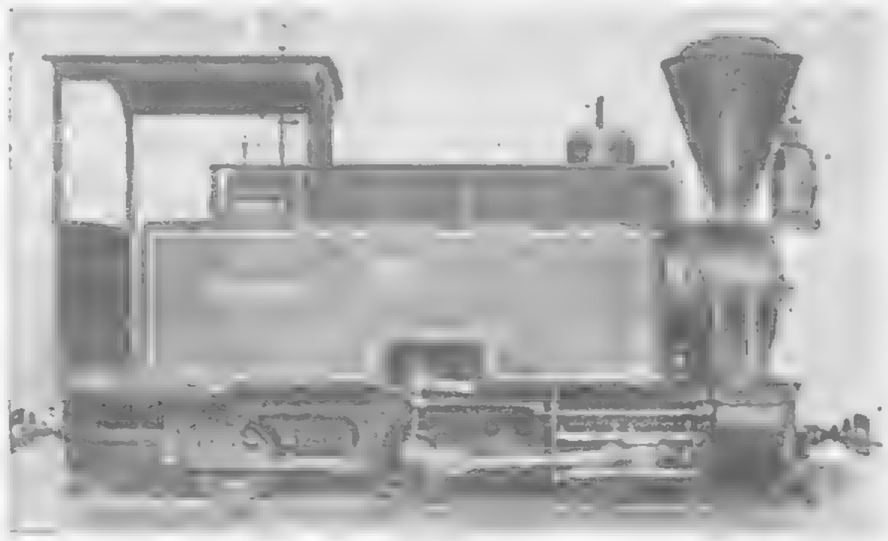
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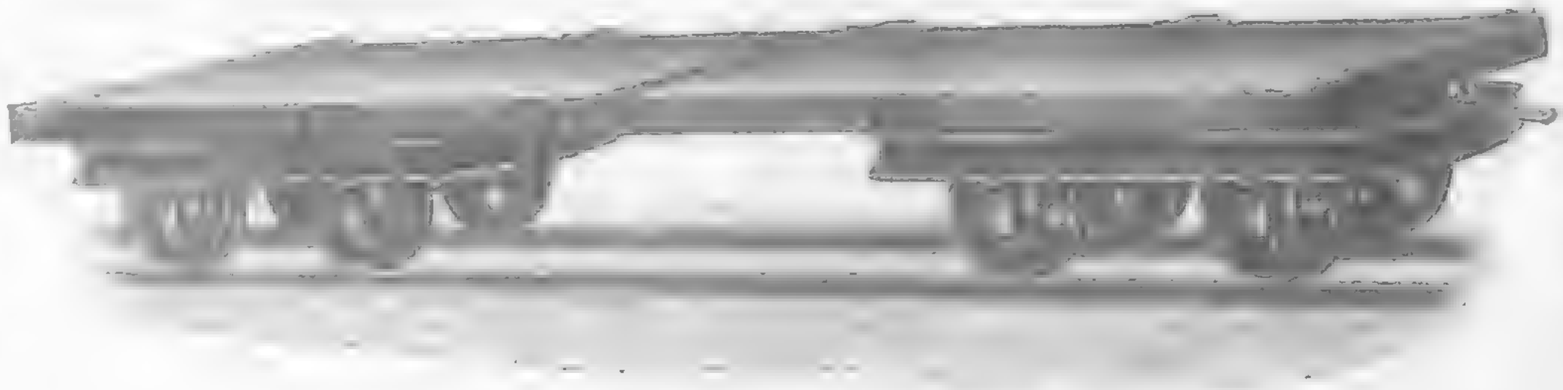
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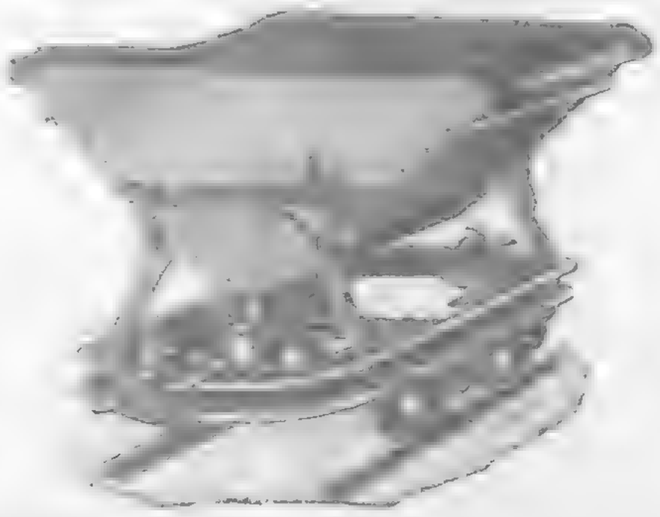
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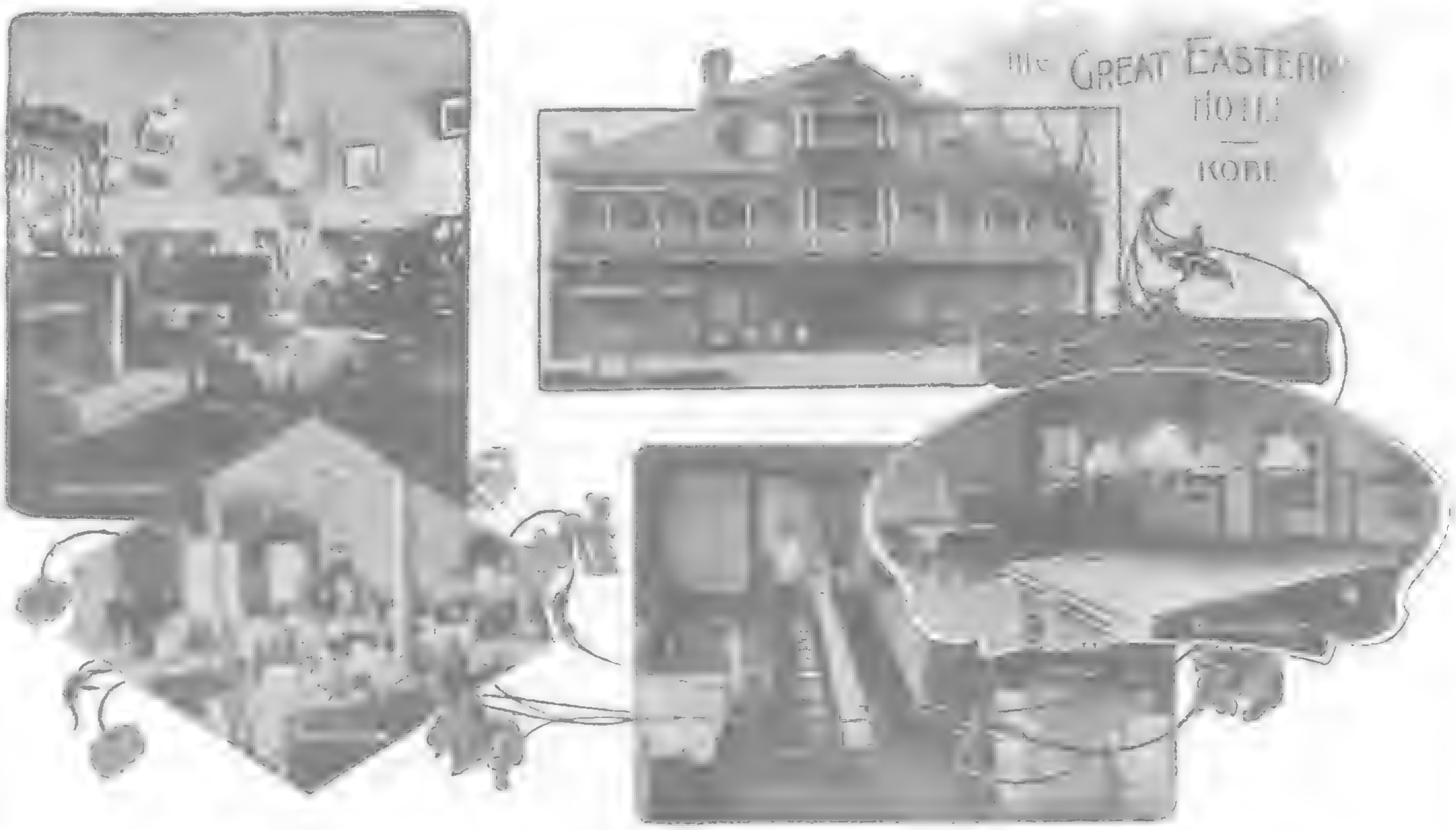


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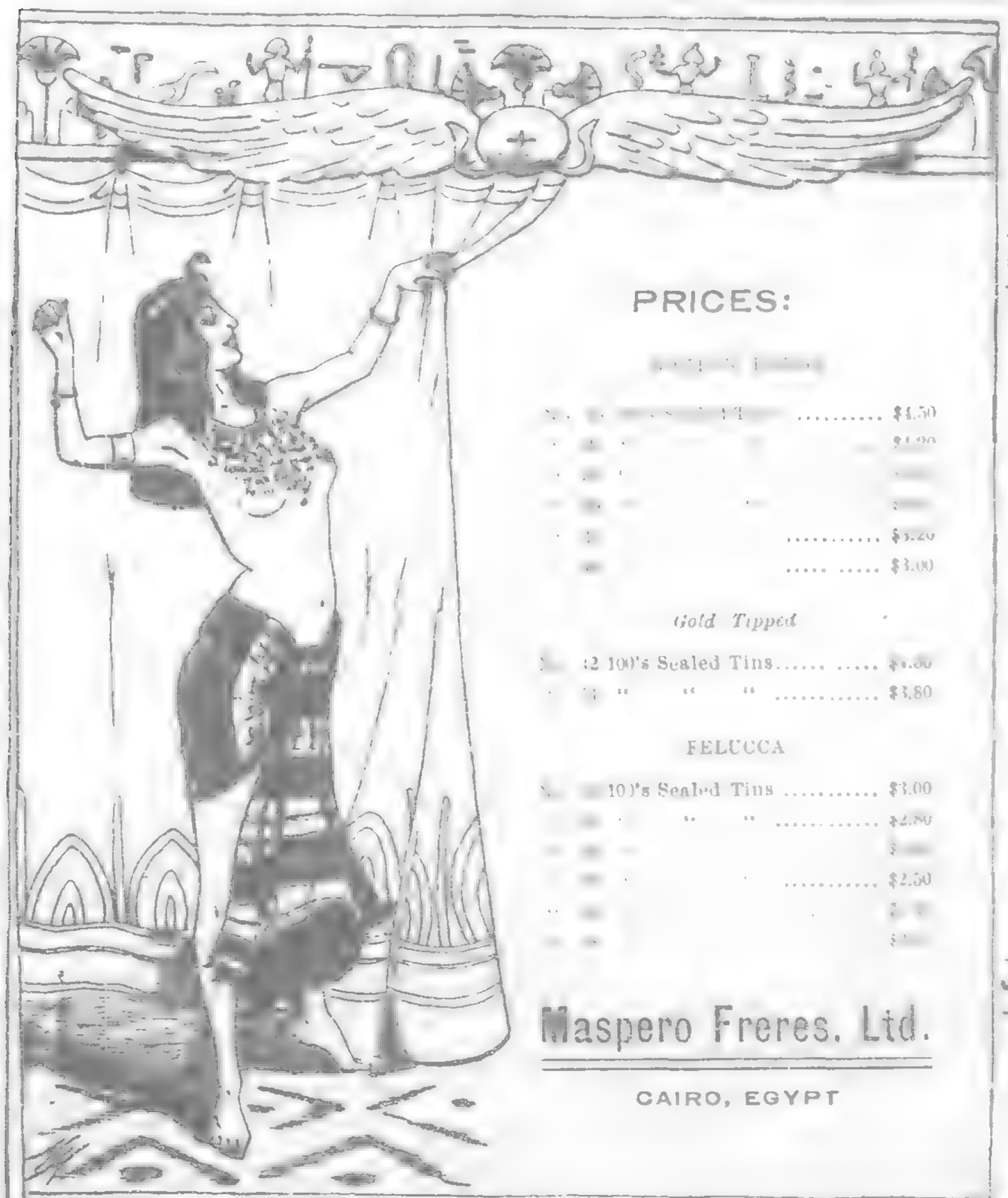







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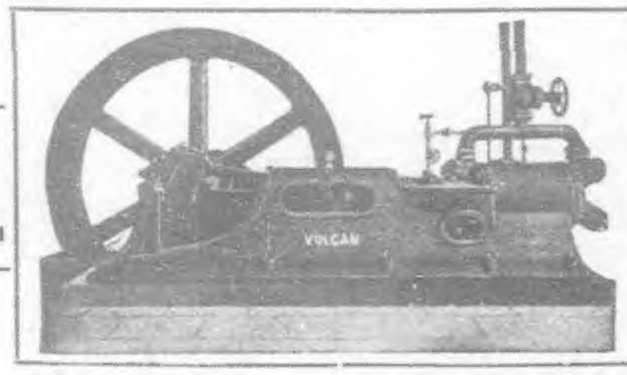
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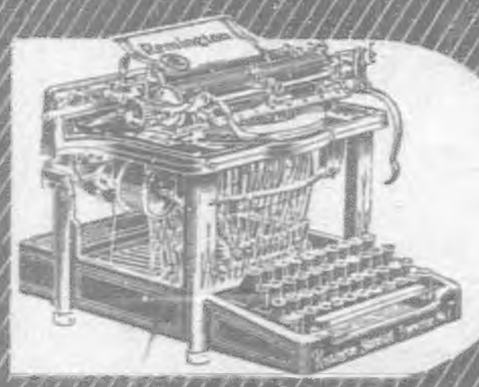
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